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ABSTRACT

Presented are analyses of likely effects of implementing either a regional or state-wide library network for the State of Washington. If a more sophisticated system is adopted over the present system, the functions of interlibrary loan, technical services, and collection management would be facilitated through new organizational arrangements. It is essential to consider the consequences in terms of both cost and benefits and their distribution among participating libraries. This research also demonstrates the need for a more extensive and reliable data base regarding library operations in the state. While this study has been primarily concerned with operating costs, estimates must be made of initial costs of setting up a new network, such as investment in computer hardware and other equipment, development of procedures and software, and employee training. (LS)

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Final Report

Project No. 9-0266
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A Study of Library Network Alternatives for the State of Washington

Part I: Text

Maryan E. Reynolds
David W. Taylor
Robert C. Meier
Roger L. Miller
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Washington State Library
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98501

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U. S. Department of
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U. S. Department of
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Maryan E. Reynolds, Washington State Librarian, served as Principal Investigator for the project. David W. Taylor, Associate State Librarian, Planning and Research, served as Project Director. Faculty at the University of Washington which participated in the project were Robert C. Meier of the Graduate School of Business Administration, Roger L. Miller of the Department of Economics, William V. Nash of the School of Librarianship, and Jonathan Stanfield of the School of Librarianship. Dr. Meier was concerned principally with the analysis of alternate network configurations. Dr. Miller, assisted in the early stages by Dr. Philip M. Ginsberg, worked on economic considerations and regression analyses. Dr. Stanfield was responsible for the Automation of Technical Services Appendix and completed the work begun by Dr. Nash on administrators' attitudes regarding the proposed network. Dr. Nash, who was killed in an automobile accident in July 1970, prepared the Administrators' Attitude questionnaire and began analysis of results obtained from it. Dr. Stanfield completed the analysis and prepared the written report of it.

Joseph Becker and Robert M. Hayes, authors of *A Proposed Library Network for the State of Washington*, served as consultants to the project. William Scholz and William Larsen both of the Washington State Library assisted Mr. Taylor.

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CHAPTER 1
INTRODUCTION, METHODS, PRINCIPAL RESULTS

In 1966 Congress added an Interlibrary Cooperation Title to the Library Services and Construction Act. The Washington State Library Commission immediately appointed an Interlibrary Cooperation Advisory Council as required, representing the library profession and the general public. The Advisory Council recommended to the State Library Commission a program of action which included retaining a consultant team to design a long range plan based on guidelines established by the Council. The State Library Commission retained Becker and Hayes who developed A Proposed Library Network for the State of Washington[1]. The Advisory Council and the State Library Commission accepted the proposed plan in concept (Fall of 1967) and directed the Washington State Library staff to provide the profession with an opportunity to discuss, criticize, and accept or reject the concept. This was done through a series of meetings around the state in the Spring of 1968. Thoughtful suggestions for improvement were made by the more than 1,000 librarians who attended the series. The concept was accepted, and the State Library was designated the agency for moving ahead on further planning and implementation. The stimulus of the Interlibrary Cooperation Funds, slight though they were, resulted in planning for library development moving ahead at a more rapid pace. The program concept was also accepted by the state administration. As the State Library and the Budget office worked to develop funding analysis, it became clear that much more information was needed before good cost analysis could be developed. The Council, State Library Commission and the State Library staff agreed that research funds should be sought to enable us to develop ways of evaluating alternate approaches to network development.

Staff at the Washington State Library together with faculty at the University of Washington prepared the research proposal and submitted it to the U.S. Commissioner of Education in January 1969. Announcement of proposal acceptance was received in June and the duration of research activity set for June 16, 1969 to June 15, 1970. The end date for the project was later extended to October 31, 1970.

The initial intent of the research project was to construct a quantitative model which would assist in making decisions regarding the details of network design such as location and type of data processing equipment, communications procedures and equipment, personnel requirements, and so forth. At a very early stage, however, it became apparent that insufficient quantitative information was available regarding library operations in the state to permit detailed design of a network. Accordingly, efforts were redirected toward obtaining basic data on the scope and characteristics of library activity, and modeling was focused on descriptions of principal library functions for several possible network configurations.

1.1 Methods

The project was conducted in two phases; first, data collection, second, analysis and modeling. Data collection extended from the inception of the study until the Spring of 1970. A sample of 33 libraries was selected which consisted of 20 municipal, county and regional public libraries (including the 19 largest), the two state universities, 3 state colleges, 7 community colleges and the Washington State Library. Data gathered were in the areas of book holdings, book collection overlap, interlibrary loans and circulation. Techniques used in this survey are described in detail in later sections. In addition, special studies were conducted, such as the circulation analyses reported in Appendix B.

Two questionnaires were utilized; one for cost information on technical services, the other for a survey of administrators' attitudes concerning networking. Results obtained from these questionnaires are presented in Chapter 3 and Chapter 5 respectively.

In the Spring of 1970 project emphasis shifted to analysis and modeling. Major activities included the development of computer programs in analyzing alternate network configurations for interlibrary loan, technical services and collection management; analysis by computer of large samples of circulation records; and correlation and multiple regression analyses to develop quantitative descriptions of a variety of existing library phenomena. Other analytical efforts were focused on development of a translation table between Library of Congress and Dewey Decimal classification schemes; and construction of a book collection overlap matrix for the 33 libraries.

1.2 Principal Results

Three different types of results were obtained from the research study. These are listed below and have been grouped according to whether they relate to methodological developments, library operations in general, or specifically to the selection of a network configuration. References in parentheses indicate the location in this report where each item is discussed in detail.

1.2.1 Methodological Developments

a) Quantitative models of the functions of interlibrary loan, technical services, and collection management were developed for each of three system configurations; the present system, a regional network, and a state-wide network. (Secs. 2.2, 3.2, and 4.2)

b) Computer programs were written to carry out the calculations required by the models. (Appendix F)

c) A Technical Services Cost questionnaire was designed. (Appendix C)

d) An Administrative Attitude questionnaire was designed. (Appendix E)

e) An L.C.-Dewey translation table was constructed with data supplied by a computer program written to analyze the relationships between the two systems. (Appendix A)

f) A book collection overlap matrix was constructed. (Appendix A)

g) A computer program was developed for analysis of book circulation records. (Appendix B)

h) A model was developed to evaluate the automation of technical services. (Appendix D)

1.2.2 Library Operations

a) Approximately 90% of books published in the United States during 1968 were acquired by the state's libraries. (Sec. 4.1)
b) Overlap of book collections is such that 10 libraries can supply approximately 95% of the titles available in all libraries in the state. (Table 4.3)

c) Over 50% of the titles in each of three libraries studied did not circulate during the periods studied. (Tables 4.6-4.9)

d) Substantial similarity existed between the age distributions of samples of books circulated by each of the two libraries even though there was considerable difference between the age distributions of their collections. (Figures 4.1 & 4.2)

e) Costs of providing centralized technical services by automation are similar to costs of providing these services manually. (Sec.D.5, Figure D.4)

f) Relationships in the form of linear equations are discernible among operational characteristics such as total circulation, additions to the collections, interlibrary loans, etc. (Appendix G)

1.2.3 Network Configurations

a) Costs. (Sec. 6.1)

-- Estimates of the annual costs of performing the functions of interlibrary loan, technical services, and collections management for three system configurations are as follows:

Present system	$2,840,000
Regional network	2,265,000
State-wide network . . .	1,625,000

-- Adjusting for anticipated increases in interlibrary loans and added communications, estimates of the annual costs of performing the three functions are:

Present system	$2,840,000
Regional network	2,830,000
State-wide network . . .	2,420,000

-- Considering the uncertainty in estimation and the minor differences in adjusted costs, cost considerations alone are insufficient to allow choice between alternate network configurations.

b) Benefits. (Sec. 6.2)

-- Both regional and state-wide network configurations offer greater access to library resources than the current system. However, state-wide networking offers by far the larger increase in resource availability.

-- Both regional and state-wide network configurations provide an improved base for growth and development. However, state-wide networking is preferred because of the larger scale of anticipated operations which would allow use of advanced technology and specialized personnel.

c) Administrative attitudes. (Sec. 5.5)

-- Administrators have generally favorable attitudes toward the concept of a network for the state.

-- Centralized technical services and collection management, which are important network concepts in this research study, while considered acceptable by administrators, are ranked lowest in desirability.

REFERENCES

1. Becker, J. and R. M. Hayes. A Proposed Library Network for Washington State. Olympia, Washington State Library, 1967

CHAPTER 2
INTERLIBRARY LOANS

As research on this network project began in the summer of 1968, a study of interlibrary loans and the functioning of the Pacific Northwest Bibliographic Center (PNBC) by Mrs. Lura G. Currier had already begun. It was decided, therefore, that another comprehensive survey of interlibrary loans would be redundant and that this project would concern itself with the general operation of interlibrary loan within the state and would focus on the quantitative aspects of the service, especially as these would relate to network design. Data have been assembled from the Currier report,[1] Annual Statistical issues of the Library News Bulletin, interviews and samples drawn by the research team, and various reports of individual libraries. The combined data from these sources provide a reasonably accurate estimate of statewide interlibrary loan activity.

2.1 Description of Current System

An overview of the volume of interlibrary lending and borrowing is provided in Table 2.1. The distribution of these transactions by the geographical regions suggested in the Becker and Hayes report[2] is shown in Figure 2.1. Borrowings by individual libraries in the state for 1969 are shown in Appendix F, Figure F.2. The level of interlibrary loan activity varies seasonally through the year with low levels of activity occurring in the summer months and higher levels in the fall and late winter and early spring. For the Washington State Library, for example, activity in 1969-70 varied from a low level of 1,780 requests in August to a high of 5,130 requests in April. Data showing year-to-year changes for three of the organizations most active in interlibrary loans are shown in Table 2.2. The volume of activity is generally increasing, but not at any regular rate. Part of the increase shown for the Washington State Library in 1968, 1969, and 1970 is due to changes in reporting procedures.

Characteristics of interlibrary loan requests are shown in part in Tables 2.3 and 2.4. Table 2.3 is a distribution by age of books from a sample of 2,008 requests at the Washington State Library, 649 requests at PNBC, and 452 requests at the University of Washington. Table 2.4 shows the distribution by Dewey class number of 452 book requests at the University of Washington and 8,305 requests at the Washington State Library. Response times for the Washington State Library and PNBC are summarized in Table 2.5. The times shown in this table are from date of request until shipment of the material, including weekends and holidays. An additional 2-3 days should be added for actual delivery of the material to the requesting location.

Major roles are played in the current interlibrary loan activity by the Washington State Library and PNBC. More than 90% of public library requests are sent to the Washington State Library which is able to fill about 75% of them. Those not filled are routed almost without

TABLE 2.1
ESTIMATED INTERLIBRARY LOAN ACTIVITY, 1969

LENDERS		BORROWERS					
		WASHINGTON LIBRARIES					OUT-OF-STATE
	TOTAL ITEMS LENT	PUBLIC LIBRARIES	WASHINGTON STATE LIB.	UNIVERSITIES COLLEGES	PUBLIC SCHOOLS	SPECIAL LIBRARIES	ALL OUT-OF-STATE LIBS.
Washington State Library	27,800	21,700	-	1,100	1,800	3,200	-
University of Washington	13,800	800	200	2,600	100	4,200	5,900
Seattle Public Library	11,500	4,200	100	400	100	4,400	2,300
Everett Public Library	2,000	1,400	-	300	100	100	100
Tacoma Public Library	1,800	1,200	-	400	-	200	-
Spokane Public Library	1,000	700	-	150	-	100	50
Others in State	3,000	900	300	1,200	100	200	300
Out-of-State	2,100	400	300	1,000	-	400	-
TOTALS	63,000	31,300	900	7,150	2,200	12,800	8,650

TABLE 2.2
CHANGES IN INTERLIBRARY LOAN ACTIVITY

FISCAL YEAR	REQUESTS TO WASH. STATE LIBRARY	REQUESTS TO PNBC	ITEMS LOANED BY SEATTLE PUBLIC LIBRARY*
1944-1945	7,100	2,930	2,170
1949-1950	12,160	9,140	2,340
1954-1955	16,320	12,390	N.A.
1959-1960	20,960	12,260	2,870
1964-1965	22,160	16,220	N.A.
1965-1966	22,900	16,080	7,370
1966-1967	22,980	18,120	7,840
1967-1968	22,970	19,370	10,580
1968-1969	31,330	17,510	12,820
1969-1970	36,070	17,770	11,430

*Data are for calendar years; 1944, 1949, etc.

TABLE 2.3
AGES OF INTERLIBRARY LOAN BOOK REQUESTS

	WASH. STATE LIB.		UNIV. OF WASHINGTON		INBC	
YEAR	VOLUMES	CUM. PERCENT	VOLUMES	CUM. PERCENT	VOLUMES	CUM. PERCENT
1969	130	6.5	2	.9	28	4.3
1968	200	16.4	19	9.5		
1967	165	24.7	22	19.4	208	36.4
1966	159	32.6	7	22.5		
1965	147	39.8	16	29.7		
1964	123	46.0	11	34.7		
1963	128	52.4	19	43.2		
1962	108	57.8	9	47.3		
1961	104	62.9	6	50.0	103	52.2
1960	74	66.6	5	52.2		
1959	59	69.6	3	53.6		
1958	70	73.1	11	58.5		
1957	59	76.0	1	59.0		
1956	42	78.1	3	60.3		
1955	40	80.1	7	63.5	310	100.0
1954	30	81.6	2	64.4		
1953	20	82.6	2	65.3		
1952	20	83.6	1	65.7		
1951	24	84.8	6	68.4		
1950	27	86.1	1	68.9		
1949	11	86.7	5	71.1		
1948	12	87.3	4	72.9		
1947	4	87.5	5	75.2		
1946	15	88.2	0	75.2		
1945	10	88.7	1	75.6		
1944	7	89.0	0	75.6		
1943	11	89.6	1	76.1		
1942	10	90.1	1	76.5		
1941	6	90.4	0	76.5		
1940	5	90.6	3	77.9		
1930-39	60	93.6	49	100.0		
1920-29	48	96.0				
1910-19	31	97.5				
1900-09	25	98.8				
Bef.1900	24	100.0				

TABLE 2.4
SUBJECTS OF INTERLIBRARY LOAN BOOK REQUESTS

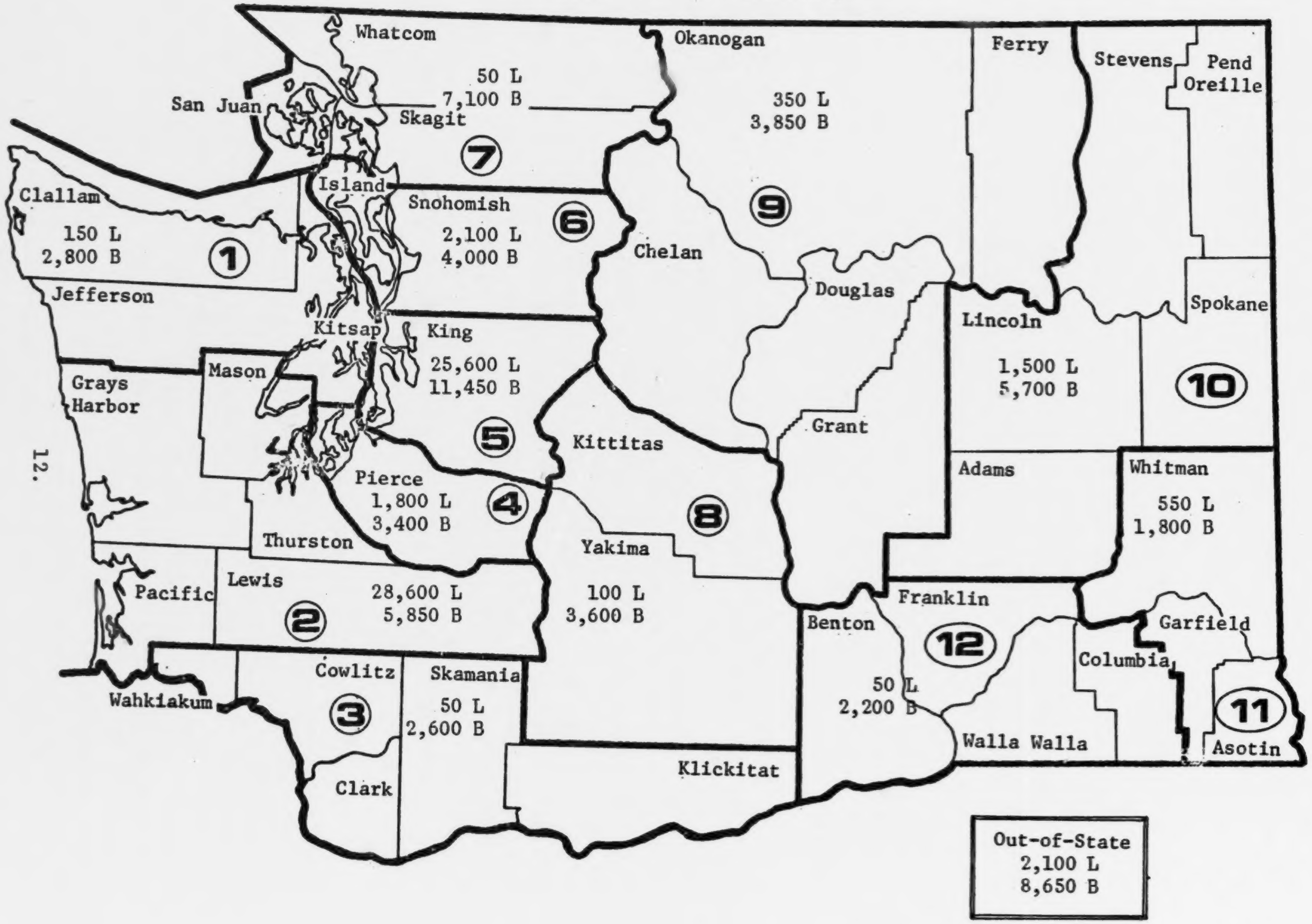
DEWEY CLASS NO.	UNIVERSITY OF WASHINGTON		WASHINGTON STATE LIBRARY	
	TITLES	PERCENT	TITLES	PERCENT
000	1	0.45	78	.95
100	4	1.80	959	11.54
200	11	4.95	324	3.90
300	39	17.57	1,725	20.79
400	4	1.80	76	.90
500	50	22.53	441	5.30
600	38	17.12	1,908	22.99
700	8	3.60	838	10.09
800	27	12.16	409	4.90
900	40	18.02	833	10.04
Biography	*	-	371	4.45
Fiction	**	-	343	4.15
Totals	222	100.00	8,305	100.00

*Included in 900's
**Included in 800's

TABLE 2.5
RESPONSE TIMES TO INTERLIBRARY LOAN REQUESTS

ELAPSED DAYS FROM DATE OF REQUEST UNTIL SHIPMENT OF MATERIAL	WASHINGTON STATE LIBRARY		PACIFIC NORTHWEST BIBLIOGRAPHIC CENTER	
	NUMBER OF CASES	CUM. PERCENT	NUMBER OF CASES	CUM. PERCENT
1	960	18.0	0	0.0
2	787	32.7	33	6.7
3	626	44.5	19	10.5
4	429	52.5	24	15.5
5	245	57.1	8	17.1
6	172	60.3	12	19.5
7	185	63.8	10	21.6
8-10	438	72.0	55	32.8
11-14	366	78.8	133	59.8
15-21	345	85.3	108	81.8
22-31)	786	100.0	48	91.6
More than 31)			42	100.0
TOTALS	5,339		492	

FIGURE 2.1
GEOGRAPHICAL DISTRIBUTION OF INTERLIBRARY LOANING AND BORROWING
(IN VOLUMES, 1969 ESTIMATES)
L = Loans B = Borrowings


Whatcom
San Juan
Skagit
50 L
7,100 B
⑦
Clallam
150 L
2,800 B
①
Jefferson
Island
Snohomish
2,100 L
4,000 B
⑥
Kitsap
King
25,600 L
11,450 B
⑤
Grays Harbor
Mason
Pierce
1,800 L
3,400 B
④
Thurston
Pacific
Lewis
28,600 L
5,850 B
②
Wahkiakum
Cowlitz
③
Clark
Skamania
50 L
2,600 B
Okanogan
350 L
3,850 B
⑨
Chelan
Douglas
Grant
Kittitas
⑧
Yakima
100 L
3,600 B
Klickitat
Ferry
Stevens
Pend Oreille
Spokane
Lincoln
1,500 L
5,700 B
⑩
Adams
Whitman
550 L
1,800 B
Franklin
Benton
⑫
50 L
2,200 B
Walla Walla
Columbia
Garfield
⑪
Asotin
Out-of-State
2,100 L
8,650 B

exception to PNBC which attempts to locate the material. Seattle Public and Tacoma Public generally deal directly with PNBC as do the academic libraries within the state. Estimated flows of requests and material involving the Washington State Library and PNBC are shown in Figure 2.2. PNBC has a location rate of approximately 85%, having located and sent loan requests for 11,739 out of 14,046 requests received.

2.2 Models of Alternate Systems

To estimate and compare operating characteristics of alternate systems of interlibrary loan, abstract representations of the systems under consideration have been developed. Many alternate system configurations can be devised, but because of time limitations only a few of these can be analyzed in detail. Three have been selected for analysis; the present system, a regional network following regional boundaries suggested in the Becker and Hayes report, and a state-wide network. The models of these three configurations are designed to reflect only aggregate lending and borrowing activity of libraries in the system and do not attempt to estimate specific flows.

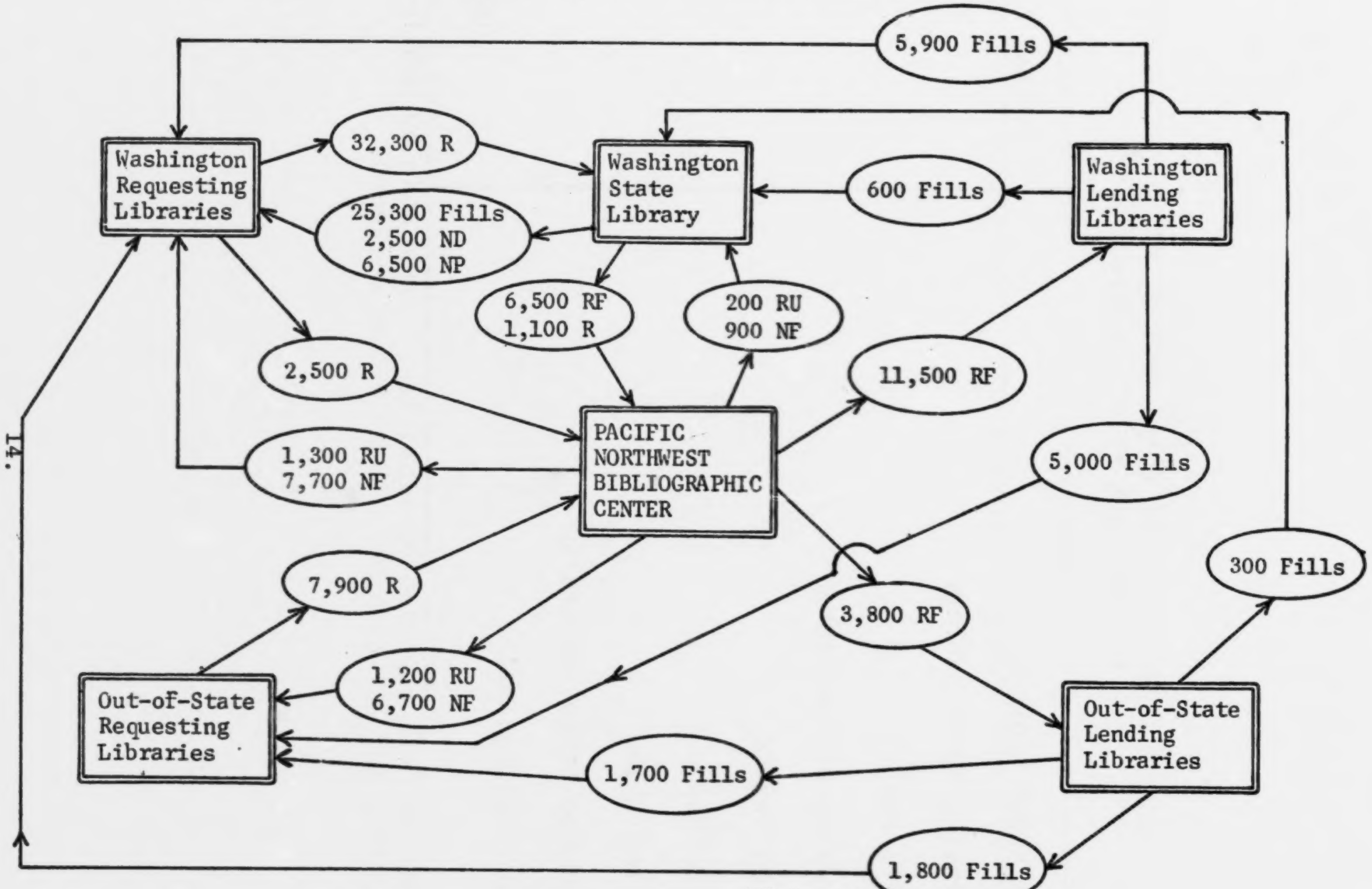
A detailed discussion of the computer program developed to perform the necessary calculations appears in Appendix F; input data to the computer program is shown in Figure F.2. Input data and the subsequent analyses cover only transactions within the state between public libraries, universities, colleges, community colleges, and the Washington State Library. Total transactions as calculated by the program do not equal those shown in Table 2.1. This is because Table 2.1 is constructed on the basis of loans reported by libraries while input to the computer program is the number of borrowings as reported by libraries. Because of these statistical discrepancies in interlibrary loan reporting, estimates of total borrowings are approximately 15% less than estimates of loans. However, since each system configuration analysis uses the same base data, the computed costs provide a satisfactory index for comparison.

For the present system, costs for each library are the sum of borrowing and lending costs. Borrowing costs are the number of volumes borrowed, which is input data, multiplied by $4.50, the estimated cost per volume borrowed. This estimate is obtained from a study of the State Library's interlibrary loan services and, while not precise, indicates the general magnitude of borrowing costs. Total borrowings are prorated to eight libraries in the state with significant lending activities on the basis of percent of loans in the state as shown in Table 2.6. Lending costs of each of the eight libraries are the number of volumes loaned multiplied by $1.50, the estimated lending cost per volume. As with borrowing costs, lending costs are based on estimates obtained from the Washington State Library and serve to indicate the magnitude of lending costs rather than providing precise estimates.

FIGURE 2.2

ESTIMATED INTERLIBRARY LOAN FLOW, 1969

(FOR REQUESTS RECEIVED BY WASHINGTON STATE LIBRARY AND PNBC ONLY)


5,900 Fills
Washington Requesting Libraries
32,300 R
Washington State Library
600 Fills
Washington Lending Libraries
25,300 Fills
2,500 ND
6,500 NP
6,500 RF
1,100 R
200 RU
900 NF
2,500 R
11,500 RF
PACIFIC NORTHWEST BIBLIOGRAPHIC CENTER
1,300 RU
7,700 NF
5,000 Fills
300 Fills
7,900 R
3,800 RF
1,200 RU
6,700 NF
Out-of-State Requesting Libraries
Out-of-State Lending Libraries
1,700 Fills
1,800 Fills

LEGEND:
R = Multiple copies of ILL requests.
RU = Request returned unfillable.
RF = Request forwarded.
ND = Notification of delay in filling.
NF = Notification that request has been forwarded to lending library.
NP = Notification that request has been forwarded to PNBC.
FILLS = Material shipped filling ILL request.

TABLE 2.6
ESTIMATED PROPORTION OF LOANS MADE BY MAJOR LENDING LIBRARIES TO LIBRARIES WITHIN WASHINGTON STATE*

LENDING LIBRARY	PERCENT OF ALL LOANS
Washington State Library	63
Seattle Public	13
University of Washington	10
Everett Public	4
Tacoma Public	4
Spokane Public	2
Washington State University	2
Timberland Regional	2
	100

* Based on data reported by libraries. Loans made by public school, special, and out-of-state libraries are excluded.

Borrowing costs for individual libraries in the regional network analysis are identical to the estimates made in the analysis of the present system. In the regional system it is assumed that the regional network is so organized that all titles within a region are available to all libraries in the region. Further, it is assumed that titles available in the state but not in the region are available through procedures such as are used in the present system. Estimates based on field studies by the research team have been made of the number of regional unique titles and state unique titles available in each library and are input data to the computer program as shown in Figure F.2. It is assumed that borrowings by libraries are equally distributed over titles available in the state so that the number of regional borrowings filled by loans from within the region is in proportion to the ratio of regional unique titles to total state unique titles. This portion of regional borrowings obtained within the region is allocated to individual lending libraries in the region on the basis of the ratio of regional unique titles held by each library to total unique titles available in the region. The portion of total regional borrowings obtained from libraries outside the region is allocated to individual lending libraries throughout the state in much the same way. Libraries are allocated a share of loans to a region based on the ratio of state-wide unique titles held by that library to total titles available in the state. (Details of the allocation of loans are given in Section F.3 of Appendix F.) Lending costs of each library are the calculated number of loans multiplied by $1.50.

In the state-wide network borrowing costs for individual libraries are the same as for the present system and the regional network. Loans are prorated to each library on the basis of the ratio of the number of state-wide unique titles held by the library to total unique titles available in the state. Again, lending costs are the number of loans multiplied by $1.50.

A summary of results obtained from the model for the three configurations is shown in Table 2.7. For each of the three configurations 32,600 borrowings and lendings occur at a cost of $4.50 per borrow and $1.50 per loan. Essentially then, costs for the three configurations are identical. Differences in totals in Table 2.7 are due to the method of allocating loans and rounding errors in the program.

The most interesting result obtained from the analysis is the similarity for most libraries between the three system configurations. The number of borrowings ~~and~~ cost of borrowing, of course, is identical for all three configurations. But in addition, the number of loans and loan costs stay much the same except for two libraries, the University of Washington and the Washington State Library. For these libraries there is a shift in loan volume from the Washington State Library to the University of Washington for the regional and state-wide networks. This is due to the method of allocating loans based on unique titles, of which the University of Washington has a much larger number. These calculations are based on current estimated costs and exclude potential hardware and software considerations.

Based on the results of the model, it does not appear that either network configuration would have a significant impact on the flow of interlibrary loans. Essentially, interlibrary loan activity is highly centralized now with only a few libraries doing much of the lending. Adoption of the regional network concept would not be expected to change this much and implementation of the state-wide network concept would only formalize what is now largely the status quo.

TABLE 2.7
TOTAL ANNUAL INTERLIBRARY LOAN COSTS

LIBRARY TYPE	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATEWIDE NETWORK
Public Libraries			
Region 1	$ 5,800	$ 6,091	$ 5,920
Region 2	12,654	12,094	11,874
Region 3	6,870	7,146	7,010
Region 4	10,956	9,826	9,464
Region 5	36,138	38,153	39,146
Region 6	12,441	11,086	10,689
Region 7	4,740	5,247	4,913
Region 8	6,362	6,721	6,605
Region 9	9,301	9,591	9,379
Region 10	12,201	13,315	12,774
Region 11	3,135	3,240	3,221
Region 12	5,445	5,800	5,662
State Total	$126,043	$128,310	$126,657
University of Washington	5,645	27,731	31,504
Washington State Univ.	2,665	4,969	5,210
W. Wash. State College	14,400	15,381	14,820
C. Wash. State College	2,812	3,269	3,005
E. Wash. State College	4,050	4,356	4,125
Community Colleges	5,287	5,816	5,606
Washington State Library	34,891	5,277	4,779
TOTALS	$195,793*	$195,109*	$195,706*

*Minor differences can be accounted for by the method of allocating loans and by rounding errors in the computer program.

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CHAPTER 3
TECHNICAL SERVICES

The notion of a centralized technical services operation for otherwise independent libraries can be traced back to 1851 when it was proposed that libraries in the United States organize in definite co-operative enterprise, including cataloging, around the Smithsonian Institution.[1] It was not until recently, however, that the concept of processing centers became a common topic of research and discussion. In the years since 1960 there has been substantial growth in both the study of and establishment of such centers. By and large, the literature has attempted to describe the parameters of operation and design with little reference to details of operational procedures and cost factors.[2,3] More recently, approaches to procedural and cost questions have been attempted,[4,5] and mathematical descriptions of the planning and operational phases have been discussed.[6] Becker and Hayes in their proposed library network for the state briefly discuss the question of a "catalog production center."[7]

Due to time and money constraints, this report concerns itself solely with technical services for books, excluding serials, periodicals, audio-visual materials, etc.

In general, technical services activities can be divided into three major categories:

> Acquisitions - All action on the order for a book from the point immediately following the decision to order until the book itself enters the cataloging process. Procedures for payment of invoice are also included.
>
> Cataloging - Activity, both intellectual and clerical, resulting in the actual bibliographic description of a book.
>
> Processing - The mechanical preparation of books to make them ready to be circulated or otherwise used in the library. This includes production of materials such as book pockets, spine labels and catalog cards.

In the remainder of this chapter, technical services activities will be discussed in terms of these major categories.

3.1 Description of Current System

The study included 106 publicly supported libraries with acquisitions in 1969 as shown in Table 3.1. Acquisitions rates varied from less than 100 volumes to more than 100,000 volumes, and operating budgets ranged from slightly over $100 to several millions of dollars per year. As these numbers indicate, the needs in terms of technical services vary widely. Data concerning technical services operations were collected both by personal visit and by questionnaire (see Appendix C). In the course of the project 33 libraries were visited, including the two state supported universities, the three state colleges, seven community colleges, and 21 public libraries. The main purpose of these visits was to collect data concerning collection characteristics, but at the same time technical services operations in these libraries were surveyed in an informal manner. The questionnaire was sent to 30 libraries of various types and was primarily intended to collect cost data. Data obtained from the questionnaires are discussed later in this section and tabulated in Tables 3.2 and 3.3.

TABLE 3.1
ACQUISITIONS BY PUBLICLY SUPPORTED LIBRARIES, 1969

TYPE OF LIBRARY*	VOLUMES ACQUIRED	TITLES ACQUIRED
Public libraries	474,878	147,938
University libraries	122,397	48,461
College libraries	48,817	36,820
Community college libraries	82,534	56,618
Washington State Library	14,727	9,732
TOTALS	743,353	299,569

*Acquisitions of individual libraries are shown in Figure F.2 of Appendix F.

There are two major activities in the acquisition function; first, the actual acquiring, i.e. ordering and receipt, and second, the payment to vendor. The method most commonly used by public libraries in performing the first activity is to select titles for purchase from publisher's catalog, review media, advertising, etc. These titles are then ordered individually from the publisher or wholesaler. The second method that libraries use to select materials is to work through approval plans operated by publishers or jobbers. This type of routine is used primarily by academic libraries, and a library usually deals with only one wholesaler. The library makes a selection from a list of criteria describing the type of books it desires. The wholesaler then supplies titles which the library is free to accept or reject.

Details of the second activity, that of payment for items received, are controlled by the method of acquiring items and fiscal requirements of the organization under which the library operates. At one extreme is the situation where each title is ordered on an individual order. When the item is received the cleared order is attached to the appropriate invoice as an approval for payment. At the other end of the scale, all orders are placed originally by the business office for the library's parent organization. In this case, the library requisitions each book and the business office places the orders with a vendor. Upon receipt of the book, the library informs the business office which then arranges for payment of the invoice.

As with acquisitions, details of cataloging vary from library to library as do the content and levels of detail of bibliographic records created in the process. Variations in procedural detail are governed by the ability of the library to perform searches for particular types of information and by the requirements of the library's clientele. For example, in a small library it may be impossible to acquire necessary cataloging tools to be able to catalog a book without help from a central source such as the Library of Congress. However, since this means delay in making the book available, it may be briefly cataloged to make it available as soon as possible. Later, when all catalog data is available, the book may be removed from the collection, the cataloging completed, and the book returned with minimum delay. Variations in level of cataloging also exist. For example, a library which serves a clientele primarily interested in recreational reading does not produce catalog cards which are as detailed as those produced in the major research libraries.

The final step in the technical services operations is production of items which help integrate the book into a collection and identify the book in the catalog. To integrate items into the collection, identifying labels and/or markings are prepared. Book cards and pockets are also produced for the circulation system. For the catalog, either cards are prepared or an entry is made in a book catalog. The libraries in this study almost without exception maintain card rather than book catalogs. The libraries of the state have varied procedures for producing catalog cards. Some hand type all copies of catalog cards, some purchase cataloging source data from the Library of Congress and hand type needed copies, and still others purchase full sets of cards for each item.

Centralization of technical services in the State of Washington is of two types. One is the municipal or district type in which individual libraries are operated as branches of a system from the technical services point of view. Materials are purchased, cataloged, and processed centrally. The second type of centralization is that typified by the relationship between Timberland Regional Library and the Washington State Library. In this case the State Library purchases, catalogs, and processes materials for the regional library. The materials are then delivered to the regional library which distributes them to its branches.

The technical services operation of the Washington State Library differs from operations in other libraries in this survey in two ways. First, it is currently engaged in the production of regularly published book catalogs for two regional libraries in the state and acts as a book processing center for one of those libraries; and second, it, like other divisions of the State Library, has the responsibility for aiding library development on a state-wide basis. Therefore, like the rest of the State Library, its operations are designed to act as experimental models for techniques and methodologies as well as to provide services on a regular basis.

Beginning in 1964, the State Library started compilation and production of a book catalog for the Timberland Library Demonstration (since established as the Timberland Regional Library, a five-county system). Its services included acquisition of materials (but not selection), cataloging and processing, and finally the provision of a book catalog. In the early days, the bibliographic data output of the cataloging operation was converted to machine-readable form via punched card and then the record exploded, sorted, and finally printed in book form beginning with a base catalog and adding supplements. There have been additional cumulations covering materials acquired through 1969.

In the midst of this production, another library system, North Central Regional Library, contracted with the State Library to provide a book catalog for its collection. This service continues with steps accomplished toward combining these catalogs into one master catalog showing holdings of both libraries. Plans are now underway for State Library involvement in the production of book catalogs for the King County Library System (a system with approximately 40 outlets) and The Evergreen State College (new four-year state college due to open in the Fall of 1971.) Many of these advances have been made feasible through the operational status of the Library of Congress' MARC (MAchine Readable Cataloging) Project. A description of the MARC Pilot Project is given in a recent paper by Pulsifer on the State Library's participation in the MARC Pilot Project.[8]

To provide a current base for projecting technical services costs for network operations in various configurations, a representative sample of publicly supported libraries was surveyed. The sample consisted of twenty public libraries, five four-year colleges and universities, and five community colleges. Questionnaires were returned by eleven (55%) of the public libraries, four (80%) of the colleges and universities, and five (100%) of the community colleges for a total return of 67%. The questionnaire gathered data sufficient for the purpose stated above. A comprehensive technical services systems analysis - necessary to take into account the unique characteristics of individual libraries and to allow definitive cost comparisons - was not possible within the time limitations of the study. Results of the questionnaire regarding estimated costs of technical services activities are summarized in Table 3.2 and Table 3.3.

3.2 Models of Alternate Systems

Models have been developed to calculate technical services costs for both titles and volumes acquired for each of three configurations; the present system, a regional network (following boundaries suggested in the Becker and Hayes report), and a state-wide network. The computer program developed to perform the necessary calculations is discussed in Appendix F. Input data to the program giving volumes and titles acquired by each library are shown in Appendix Figure F.2.

TABLE 3.2
COST ESTIMATES OF TECHNICAL SERVICES ACTIVITIES - PUBLIC LIBRARIES

LIBRARY	TITLES ACQUIRED	VOLUMES ACQUIRED	ACQUISITION COSTS	CATALOGING COSTS	PROCESSING COSTS	ACQUISITION COSTS/ TITLE	CATALOGING COSTS/ TITLE	PROCESSING COSTS/ VOLUME
1	179	198	$ 313	$ 1,223	$ 428	$ 1.746	$ 6.832	$ 2.162
2	394	394	148	531	388	0.375	1.348	0.985
3	3,000	3,144	1,536	3,510	2,607	0.512	1.170	0.829
4	3,676	6,769	4,800	7,490	3,233	1.306	2.038	0.478
5	3,918	5,829	3,041	4,013	1,956	0.776	1.024	0.336
6	4,207	13,491	2,174	7,567	10,051	0.512	1.799	0.745
7	5,100	5,400	2,022	6,534	3,019	0.396	1.281	0.559
8	5,652	11,413	2,688	7,809	6,966	0.476	1.382	0.610
9	6,009	21,134	19,526	16,984	13,769	3.249	2.826	0.652
10	6,200	7,219	5,480	15,971	5,920	0.884	2.576	0.820
11	11,305	77,100	48,147	57,961	25,703	4.259	5.127	0.333
AVERAGE	4,513	13,826	$ 8,170	$11,781	$ 6,731	$ 1.810	$ 2.611	$ 0.487
MEDIAN	4,207	6,769	$ 2,688	$ 7,490	$ 3,233	$ 0.884	$ 2.038	$ 0.745

TABLE 3.3
COST ESTIMATES OF TECHNICAL SERVICES ACTIVITIES - ACADEMIC LIBRARIES

LIBRARY	TITLES ACQUIRED	VOLUMES ACQUIRED	ACQUISITION COSTS	CATALOGING COSTS	PROCESSING COSTS	ACQUISITION COSTS/ TITLE	CATALOGING COSTS/ TITLE	PROCESSING COSTS/ VOLUME
COMMUNITY COLLEGES:								
1	1,450	1,500	$ 2,716	$ 8,225	$ 3,730	$ 1.873	$ 5.672	$ 2.487
2	3,000	4,000	1,391	14,282	7,104	0.464	4.761	1.766
3	3,281	3,281	4,890	6,472	3,264	1.490	1.973	0.995
4	4,801	5,854	19,158	27,201	8,255	3.990	5.666	1.410
5	5,045	6,545	11,531	6,054*	5,231	2.286	1.200	0.799
AVERAGE	3,515	4,236	$ 7,937	$ 12,446	$ 5,516	$ 2.258	$ 3.541	$ 1.302
MEDIAN	3,281	4,000	$ 4,890	$ 8,225	$ 5,231	$ 1.873	$ 4.761	$ 1.410
FOUR-YEAR COLLEGES & UNIVERSITIES:								
1	13,000	13,982	$ 25,064	$ 50,518	$ 7,079	$ 1.928	$ 3.886	$ 0.506
2	16,000	16,393	38,284	47,130	15,936	2.393	2.946	0.972
3	19,541	23,278	26,043	67,328	36,569	1.333	3.445	1.571
4	38,375	84,591	101,486	114,048	30,555	2.645	2.972	0.361
AVERAGE	21,729	34,561	$ 47,719	$ 69,756	$ 22,534	$ 2.196	$ 3.210	$ 0.652
MEDIAN	17,771	19,836	$ 32,164	$ 58,923	$ 23,246	$ 2.161	$ 3.429	$ 0.739

* This dollar figure is the product of $1.20 times the number of titles acquired since, according to the questionnaire, this institution buys all titles precataloged at the above per title cost.

For the present system, technical services costs for each library are the sum of volume processing costs and title processing costs (made up of acquisition costs plus cataloging costs). Volume processing costs are estimated to be $.60 per volume, regardless of library type. Title processing costs are estimated to be $5.00 per title ($2.00 acquisition cost plus $3.00 cataloging cost) regardless of library type. These estimates are based on data shown in Tables 3.2 and 3.3. For example, the total costs for a one-volume work would be $5.60 ($5.00 title processing cost plus $.60 volume processing cost). For a two-volume work or two copies of the same title, the costs would be $6.20 ($5.00 title processing plus $.60 volume processing for first volume or copy plus $.60 volume processing for second volume or copy).

The regional and state-wide network calculations make use of the concept of regional unique titles and state-wide unique titles in each library. These are data which are input to the program and are shown in Figure F.2. Estimates of unique titles are based on the study made by the research team of overlap between collections which is discussed in Appendix A of this report. Regional unique titles for each library in a region are found by estimating the number of titles in the largest library in the region, using the overlap data to estimate additional unique titles in the second largest library and following this procedure on down to the smallest library in the region. For state-wide unique titles the same procedure is used, but the process starts with the largest library in the state and works down to the smallest in the state.

Volume processing costs for each library in the regional network are estimated to be $.60 per volume as in the present system. Costs to process a title are estimated to be an acquisition cost of $2.00 per title plus a share of cataloging costs in the region, on the assumption that cataloging would be shared in the region through the network. The average amount of cataloging per title acquired in the region is the ratio of total regional unique titles to the sum of titles in individual libraries in the region, and this ratio is multiplied by $3.00 to find average cataloging cost per title acquired for each library in the region. No attempt is made to determine the specific library performing the cataloging. Instead, average costs are prorated to all libraries in the region. The $2.00 and $3.00 cost estimates used above are once more based on the approximately level of costs shown in Tables 3.2 and 3.3.

In the state-wide network volume processing costs are the same as in the present system and regional network configurations. Costs to process a title are estimated to be an acquisition cost of $2.00 per title plus a share of cataloging costs in the state, on the assumption that cataloging would be shared state-wide through the network. The average amount of cataloging per title acquired in the state is the ratio of total unique titles in the state to the sum of titles in individual libraries in the state. This ratio is multiplied by $3.00 to find average cataloging costs per title acquired. No attempt is made to determine the specific library performing the cataloging.

A summary of results obtained from the model for the three-system configurations is shown in Table 3.4. Care should be used in interpreting the table since it reflects only average costs for each system and does not reflect actual costs to the specific libraries that would do the cataloging in the regional and state-wide networks. Also, communications costs and possible changes in costs of performing these activities in the regional and state-wide systems are not considered. These are discussed later in the report. The analysis does show, however, that there are potential savings through sharing of cataloging of approximately $325,000 under the regional network plan and approximately $680,000 per year under the state-wide network plan.

TABLE 3.4
ESTIMATES OF TOTAL ANNUAL TECHNICAL SERVICES COSTS

LIBRARY TYPE	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Public Libraries:			
Region 1	$ 60,629	$ 49,769	$ 38,742
Region 2	53,712	45,821	37,072
Region 3	56,878	43,120	35,696
Region 4	117,149	99,207	78,237
Region 5	262,004	234,959	196,994
Region 6	84,176	72,522	54,210
Region 7	72,068	53,745	44,088
Region 8	59,078	47,528	36,864
Region 9	30,251	27,833	22,502
Region 10	113,660	93,369	72,545
Region 11	35,328	32,236	21,326
Region 12	79,653	60,274	50,826
State Total	$1,024,586	$ 860,383	$ 689,102
University of Washington	226,061	192,963	146,495
Washington State University	89,682	82,990	59,363
Western Washington State College	127,108	94,254	76,933
Central Washington State College	72,260	57,743	44,338
Eastern Washington State College	14,021	11,360	8,628
Community Colleges	332,603	271,304	204,212
Washington State Library	57,496	47,033	35,428
TOTALS	$1,943,817	$1,618,030	$1,264,499

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CHAPTER 4
COLLECTION MANAGEMENT

This chapter is concerned with library resources available in the state, the degree to which these resources are duplicated between libraries and the frequency of use of these materials by library patrons. This general area of concern has been designated "collection management." Because of time and budget limitations, the study has been restricted to book holdings and book circulations only. While periodical and audio-visual materials are also of major importance, an analysis focused on books should provide an indication of general resource and service patterns. Union lists of periodicals are now being compiled, as is a state-wide directory of audio-visual holdings, and these should provide additional relevant data when they become available.

4.1 Description of Current Book Holdings and Usage

Data on book collections were developed from available statistical data and through visits of members of the research team to libraries within the state. Table 4.1 provides a general picture of relative subject strength in the ten largest libraries in the state. Titles, not volumes, are shown because of the wide variation in volume to title ratios which are characteristic of libraries. For example, the collections of King County, the University of Washington and the Washington State Library have estimated volume to title ratios of 8.3 to 1, 2.4 to 1, and 1.4 to [illegible]. respectively. To compare libraries with different classification schemes, a computer program was developed which analyzed MARC II cataloging data. This allowed researchers to construct a translation table between the Library of Congress classification and the Dewey Decimal classification. The results of the program are discussed further in Appendix A.

Table 4.2 compares the percent of holdings in Dewey Decimal classifications versus percent of circulations in these classifications. The data are presented for six libraries in the state for which holdings and circulations could be matched in a reasonably consistent manner.

To determine the degree to which library book collections duplicate each other, a sample of recently published titles was selected and checked against holdings of libraries in the state. Details of the study are given in Appendix A. In general, the study involved the selection of 500 titles from the 1968 monthly issues of the American Book Publishing Record and searching them against holdings in 33 libraries throughout the state. Table 4.3 summarizes the results of the study. 438 of the sample titles were located in the 33 libraries. Extrapolating from this sample, it is estimated that 88% or 24,400 titles published in 1968 are available in these libraries. Allowing for some retrospective purchasing and additional titles in the libraries not searched, it is estimated that approximately 90% of currently published American titles are purchased by the state's libraries.

TABLE 4.1
BOOK HOLDINGS OF THE LARGEST LIBRARIES
ADULT ONLY -- LC CLASSED TITLES HAVE BEEN TRANSLATED TO DDC

Library	000's	100's	200's	300's	400's	500's	600's	700's	800's	900's	Biog (B,920)	Fiction	Total Titles
University of Washington	18,875	23,016	18,384	146,187	14,178	80,228	103,036	55,292	137,730[1]	82,842[2]	28,973[2]	--	708,741
Seattle Public Library	7,784	10,298	11,141	59,135	4,221	27,439[3]	52,148	50,584	27,984	45,732	26,703	33,131	356,300
Wash. State University	7,345	7,235	10,012	62,904	4,929	29,165	39,685	21,050	56,739[1]	39,580[2]	4,455[2]	--	283,099
Washington State Library	5,560	6,130	4,860	36,560	1,780	9,610	30,290	15,810	11,920	11,240	7,830	4,480[4]	146,070
Spokane Public Library	3,327	2,201	3,078	14,103	1,165	5,249	14,093	13,735	10,717	20,856	7,968	29,990	126,482
Western Washington St. Coll.	5,237	5,042	4,416	32,501	1,707	11,885	9,718	9,927	23,113[1]	16,472[5]	--	--	120,018
Tacoma Public Library	2,340	2,823	3,403	17,052	1,375	6,263	13,968	16,792	11,509	18,211	7,437	18,449	119,622
Central Washington St. Coll.	4,628	2,728	4,941	31,966	1,664	11,454	9,540	11,102	18,395[1]	13,545[5]	--	--	109,963
Eastern Washington St. Coll.	1,892	3,726	1,936	22,650	1,328	7,489	7,665	6,859	13,152[1]	14,850	6,735	--	88,282
King County Regional Lib.	1,257	2,060	1,857	8,133	619	4,477	7,107	9,109	6,682	10,598	6,672	22,657	81,228

1. Includes Fiction.
2. Biography vs. 900's reflects DDC proportions.
3. Includes Aeronautics, usually classed in 600's.
4. Purchase of Fiction is a rarity.
5. Biography included.

TABLE 4.2
HOLDINGS VERSUS CIRCULATION BY DEWEY CLASSIFICATION FOR SELECTED LIBRARIES

DEWEY CLASSIFICATION	WASHINGTON STATE LIBRARY		SEATTLE PUBLIC		TACOMA PUBLIC		WASHINGTON STATE UNIVERSITY		WESTERN WASHINGTON STATE COLLEGE		EASTERN WASHINGTON STATE COLLEGE	
	PERCENT HOLDINGS	PERCENT CIRC.	PERCENT HOLDINGS	PERCENT CIRC.*	PERCENT HOLDINGS	PERCENT CIRC.*	PERCENT HOLDINGS	PERCENT CIRC.	PERCENT HOLDINGS	PERCENT CIRC.	PERCENT HOLDINGS	PERCENT CIRC.
000's	3.8	1.4	2.2	.3	1.9	.2	2.6	1.2	4.4	1.2	2.1	.4
100's	4.2	8.4	2.9	5.1	2.4	2.2	2.5	5.5	4.2	9.1	4.2	6.1
200's	3.3	2.1	3.1	2.1	2.8	1.5	3.7	3.8	3.7	3.1	2.2	2.0
300's	25.0	27.8	16.6	9.8	14.3	11.7	22.2	27.9	27.1	33.8	25.7	27.6
400's	1.2	1.0	1.2	.6	1.2	.4	1.7	1.1	1.4	.7	1.5	.3
500's	6.6	5.4	7.7	5.1	5.2	2.4	10.3	6.8	9.9	11.2	8.5	8.3
600's	20.7	22.6	14.6	11.3	11.7	8.9	14.0	11.1	8.1	7.2	8.7	13.2
700's	10.8	13.7	14.2	13.3	14.0	8.3	7.4	8.0	8.3	9.8	7.8	12.2
800's	8.2	5.5	7.9	6.2	9.6	6.9	20.0	20.0	19.2	6.3	14.9	14.4
900's	7.7	6.7	12.7	8.4	15.2	12.1	14.0	13.9	13.7	17.6	24.4	15.5
Biography	5.4	2.6	7.5	4.7	6.2	4.7	1.6	.6	**		**	
Fiction	3.1	2.8	9.4	33.1	15.5	40.7	***		***		***	
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Adult circulation only.
** Biography included in 900's.
*** Fiction included in 800's.

TABLE 4.3
CUMULATION OF DIFFERENT TITLES FOUND
1968 SAMPLE OF 500 TITLES PUBLISHED

NO.	LIBRARY	TITLES FOUND	DIFFERENT TITLES ADDED	CUMULATED TITLES ADDED	CUMULATED PERCENTAGE
1	Washington State Univ.	209	209	209	47.72
2	West. Wash. St. Coll.	198	53	262	59.82
3	Univ. of Washington	191	41	303	69.18
4	Seattle Public	183	66	369	84.25
5	Cent. Wash. St. Coll.	172	9	378	86.30
6	Washington State Lib.	139	16	394	89.95
7	Tacoma Public	120	14	408	93.15
8	King County	112	8	416	94.98
9	Pierce County	107	4	420	95.89
10	Spokane Public	107	4	424	96.80
11	Spokane County	90	5	429	97.95
12	Longview Public	87	0	429	97.95
13	Sno-Isle Regional	87	0	429	97.95
14	Yakima Valley Regional	86	2	431	98.40
15	Timberland Regional	79	1	432	98.63
16	Bellingham Public	68	0	432	98.63
17	Everett Public	67	1	433	98.86
18	Richland Public	64	0	433	98.86
19	Fort Vancouver Regional	62	0	433	98.86
20	Kitsap County Regional	62	0	433	98.86
21	Seattle Community Coll.	62	0	433	98.86
22	Mid-Columbia Regional	59	2	435	99.32
23	Tacoma Community Coll.	55	1	436	99.54
24	Shoreline Community Coll.	54	0	436	99.54
25	Walla Walla Public	52	2	438	100.00
26	East. Wash. St. Coll.	45	0	438	100.00
27	North Central Regional	42	0	438	100.00
28	Puyallup Public	23	0	438	100.00
29	Whatcom County Regional	17	0	438	100.00
30	Yakima Valley Regional	17	0	438	100.00
31	Everett Comm. Coll.	16	0	438	100.00
32	Green River Comm. Coll.	11	0	438	100.00
33	Centralia Comm. Coll.	7	0	438	100.00
	TOTALS	2,750	438	438	100.00

Since no one library purchased more than 42% of the available titles, there is considerable potential benefit to be derived from the cooperative purchase and use of books acquired in the state.

A complete analysis of age of the collections by Dewey Decimal classification for the Washington State Library and Seattle Public Library is presented in Appendix Table A.8. Table 4.4 shows a summary of the age distribution of book holdings by subject for these two libraries. Appendix Table B.3 gives a complete analysis by Dewey Decimal classification of the age distribution of books circulated in the Washington State Library and Seattle Public Library during January 1970. Table 4.5 shows a summary of the age distribution of books circulated for all classifications for these two libraries. Figure 4.1 shows the comparison between distribution of holdings and distribution of circulation by age for the Washington State Library, and Figure 4.2 shows the same data for the Seattle Public Library. Both Figures 4.1 and 4.2 indicate a considerable difference between the age distribution of book holdings and age distribution of circulation. Circulations are much more concentrated in recent books than are holdings. This is more striking in the case of the Seattle Public Library which has the older collection.

The availability of circulation records in machine readable form at Central Washington State College permitted a computer analysis of that library's circulation for an 18-month period. During that period 75,400 circulations of 30,900 titles were recorded. A summary of results of the analysis is shown in Table 4.6 and further details are given in Appendix B. Machine readable circulation records were also available from the Bellingham Public Library for a 3-month period. Table 4.7 provides an analysis of these circulations. The data base consisted of 111,800 circulations of 34,700 titles. For both libraries the majority of titles did not circulate during the period of study. For Central Washington 33% circulated in 18 months; for Bellingham 39% circulated in 3 months. A similar situation was found at the Washington State Library where 66% of a sample of 1,490 titles did not circulate in 1969. Complete results of the study at the Washington State Library are tabulated in Appendix B. Tables 4.8 and 4.9 show the frequency of circulation for all titles in the Central Washington Library and the Bellingham Public Library respectively. The very high proportion of titles which did not circulate or circulated infrequently is evident. Use of books within the library is excluded from the statistics above since no records are available.

4.2 Models of Alternate Systems

Data presented in the preceding section, particularly as it relates to overlap between collections and frequency of circulation, suggest that there may be possibilities for improved effectiveness and use of resources through cooperative interlibrary management of collections.

TABLE 4.4
AGE DISTRIBUTION OF BOOK HOLDINGS

YEAR OF PUBLICATION	WASHINGTON STATE LIBRARY PERCENT	WASHINGTON STATE LIBRARY CUMULATIVE PERCENT	SEATTLE PUBLIC LIBRARY PERCENT	SEATTLE PUBLIC LIBRARY CUMULATIVE PERCENT
1969	5.5	5.5	4.0	4.0
1968	9.5	15.0	6.5	10.5
1967	9.1	24.1	4.6	15.1
1966	4.8	28.9	3.5	18.6
1965	3.8	32.7	5.1	23.7
1964	3.9	36.5	2.9	26.6
1963	4.2	40.7	3.1	29.6
1962	3.8	44.6	1.7	31.3
1961	4.1	48.7	2.7	34.0
1960	4.1	52.8	2.2	36.2
1959	3.2	56.0	1.6	37.8
1958	2.3	58.3	3.2	40.9
1957	2.3	60.6	1.0	41.9
1956	2.3	62.8	2.6	44.5
1955	2.3	65.1	1.0	45.5
1954	1.9	67.0	1.0	46.6
1953	1.8	68.8	1.7	48.2
1952	1.7	70.5	1.3	49.5
1951	1.1	71.6	1.4	50.9
1950	1.2	72.8	1.2	52.1
Before 1950	27.2	100.0	47.9	100.0

TABLE 4.5
AGE DISTRIBUTION OF BOOK CIRCULATIONS
JANUARY 1970

YEAR OF PUBLICATION	WASHINGTON STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
	PERCENT	CUMULATIVE PERCENT	PERCENT	CUMULATIVE PERCENT
1969	9.6	9.6	10.4	10.4
1968	13.2	22.8	10.2	20.6
1967	9.8	32.6	7.8	28.4
1966	6.8	39.4	6.3	34.8
1965	7.2	46.6	7.2	41.9
1964	4.7	51.3	7.0	49.0
1963	6.7	58.0	5.6	54.5
1962	4.8	62.8	4.3	58.9
1961	3.9	66.7	4.4	63.3
1960	5.6	72.3	3.5	66.7
1959	3.2	75.5	2.6	69.3
1958	2.4	77.9	3.2	72.5
1957	2.4	80.3	2.7	75.2
1956	2.3	82.5	1.9	77.1
1955	1.8	84.3	2.2	79.3
1954	1.6	85.9	2.0	81.3
1953	.7	86.6	1.7	83.0
1952	1.6	88.1	1.3	84.3
1951	.7	88.8	1.0	85.3
1950	.7	89.5	1.0	86.4
Before 1950	10.5	100.0	13.6	100.0

FIGURE 4.1
HOLDINGS VERSUS CIRCULATION BY AGE FOR WASHINGTON STATE LIBRARY
(From Tables 4.4 and 4.5)

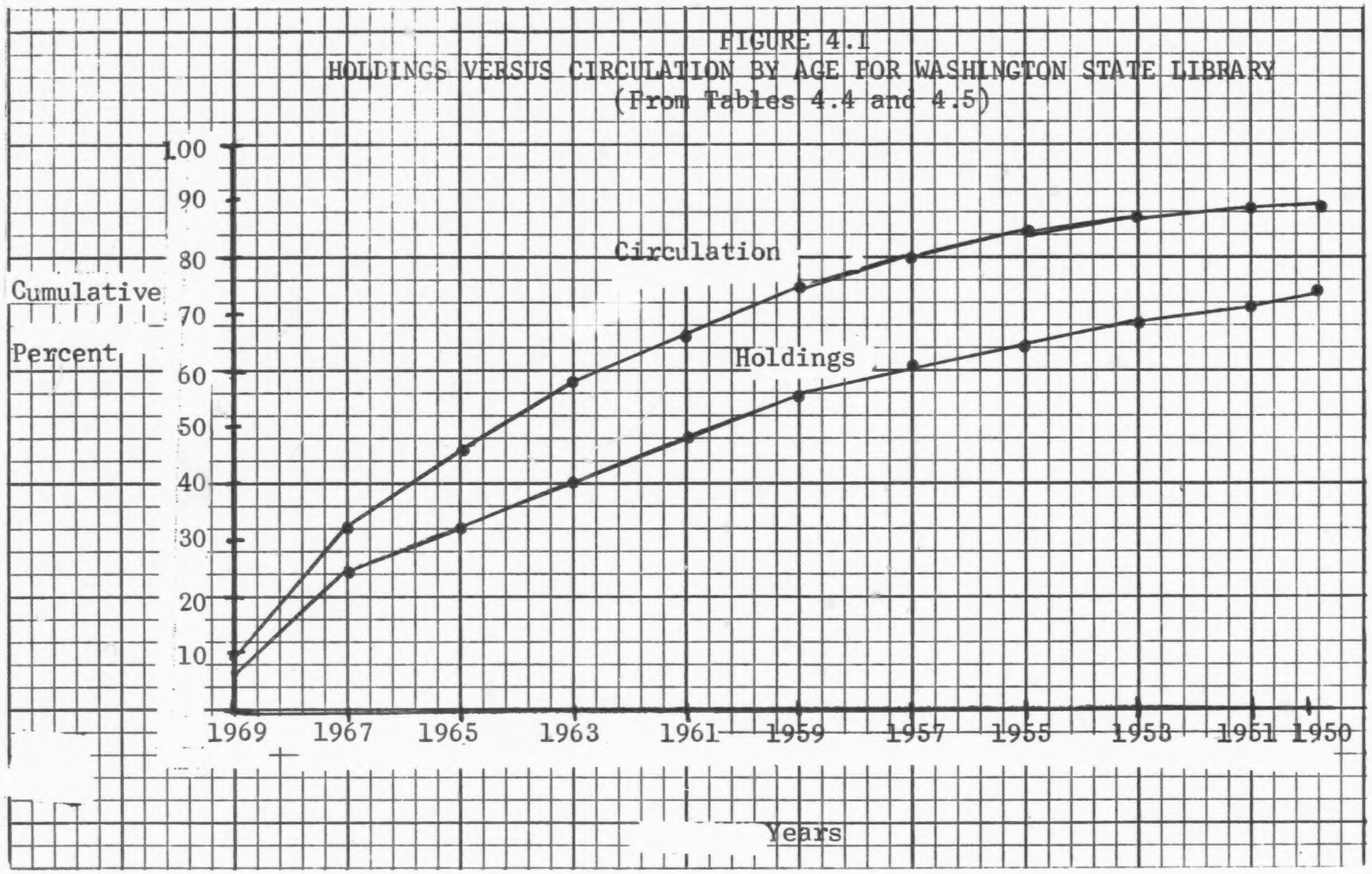

FIGURE 4.2
HOLDINGS VERSUS CIRCULATION BY AGE FOR SEATTLE PUBLIC LIBRARY
(From Tables 4.4 and 4.5)

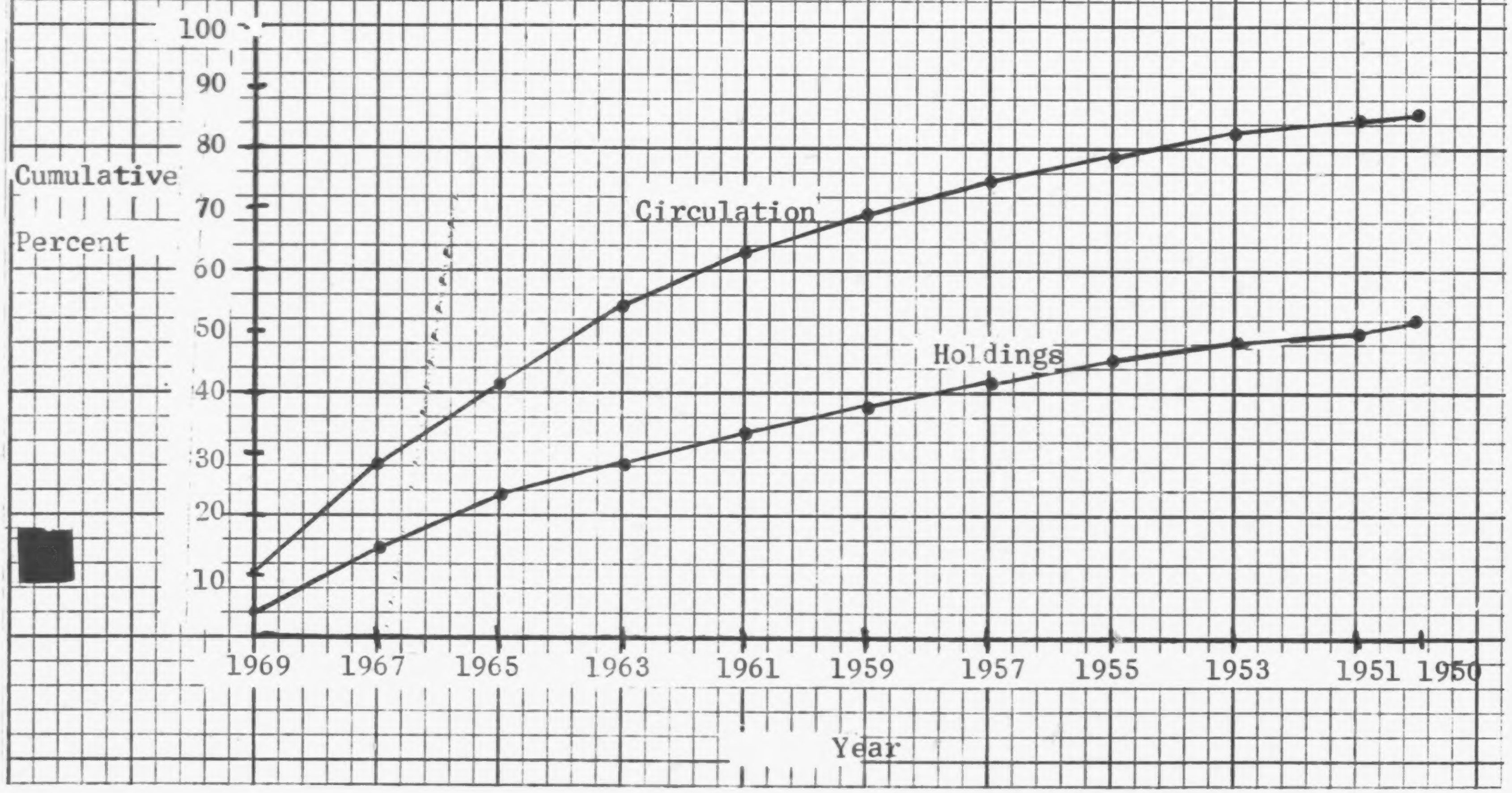

TABLE 4.6
ANALYSIS BY SUBJECT OF BOOK CIRCULATIONS
CENTRAL WASHINGTON STATE COLLEGE
(January 2, 1968 - June 30, 1969)

SUBJECT CLASS	TITLES AVAILABLE	TITLES WHICH CIRCULATED	% OF TITLES CIRCULATED	CIRCULATION
A	917	25	2.5	47
B	6,215	2,876	46.3	8,095
C	505	182	36.1	325
D	7,728	3,010	39.0	6,834
E	3,555	1,313	37.5	2,741
F	2,905	819	28.2	1,490
G	2,519	1,096	43.6	2,770
H	12,558	5,053	40.3	14,743
J	3,134	921	29.4	1,974
K	642	98	15.3	176
L	8,278	2,765	33.4	8,574
M	3,340	632	18.9	1,362
N	3,868	1,788	46.2	4,596
P	19,413	4,576	23.6	8,741
Q	10,188	2,748	27.0	6,126
R	2,049	884	43.1	2,197
S	620	294	47.4	661
T	3,020	1,215	40.2	2,770
U	199	132	66.4	259
V	42	21	50.0	37
Z	3,274	428	13.1	847
TOTALS	94,969	30,876	32.6%	75,365

TABLE 4.7
ANALYSIS BY SUBJECT OF BOOK CIRCULATIONS
BELLINGHAM PUBLIC LIBRARY
(January 1, 1970 - March 31, 1970)

SUBJECT CLASS	TITLES AVAILABLE	TITLES WHICH CIRCULATED	% OF TITLES CIRCULATED	CIRCULATION
000's	731	412	56.4	595
100's	1,373	777	56.5	2,358
200's	2,141	843	39.3	1,640
300's	7,823	3,157	40.4	7,522
400's	697	178	25.6	379
500's	4,822	1,704	35.4	4,218
600's	8,586	4,558	53.3	12,515
700's	6,899	3,401	49.4	8,833
800's	8.177	2,529	30.9	4,594
900's	19,421	5,352	27.6	12,918
Fiction	28,099	11,813	42.1	56,311
TOTALS	88,769	34,724	39.1%	111,833

TABLE 4.8
FREQUENCY OF CIRCULATION OF TITLES
CENTRAL WASHINGTON STATE COLLEGE
(January 2, 1968 - June 30, 1969)

NO. OF TIMES CIRCULATED	NO. OF TITLES	PERCENT	CUMULATIVE PERCENT
0	64,093	67.49	
1	14,225	14.98	82.47
2	6,871	7.23	89.70
3	3,720	3.92	93.62
4	2,140	2.25	95.87
5	1,335	1.41	97.28
6	849	0.89	98.17
7	541	0.57	98.74
8	359	0.38	99.12
9	237	0.25	99.37
10	139	0.15	99.52
11	113	0.12	99.64
12	98	0.10	99.74
13	54	0.06	99.80
14	42	0.04	99.84
15	28	0.03	99.87
16	21	0.02	99.89
17	18	0.02	99.91
18	17	0.02	99.93
19	8	0.01	99.94
20	5	0.01	99.95
21	5	0.01	99.96
22	9	0.01	99.97
23	1	0.00	99.97
24	3	0.00	99.97
25 or more	38	0.04	100.04
TOTAL	94,969	100.01	

TABLE 4.9
FREQUENCY OF CIRCULATION OF TITLES
BELLINGHAM PUBLIC LIBRARY
(January 1, 1970 - March 31, 1970)

NO. OF TIMES CIRCULATED	NO. OF TITLES	PERCENT	CUMULATIVE PERCENT
0	54,045	60.88	
1	12,618	14.21	75.09
2	7,642	8.61	83.70
3	4,827	5.44	89.14
4	2,952	3.33	92.47
5	1,892	2.13	94.60
6	1,221	1.38	95.98
7	861	0.97	96.95
8	593	0.67	97.62
9	419	0.47	98.09
10	348	0.39	98.48
11	268	0.30	98.78
12	170	0.19	98.97
13	153	0.17	99.14
14	120	0.14	99.28
15	89	0.10	99.38
16	84	0.09	99.47
17	71	0.08	99.55
18	49	0.06	99.61
19	49	0.06	99.67
20	48	0.05	99.72
21	36	0.04	99.76
22	30	0.03	99.79
23	26	0.03	99.82
24	17	0.02	99.84
25 or more	141	0.16	100.00
TOTALS	88,769	100.00	

Discussion here will be limited to some of the economic effects of interregional and state-wide collection management. In other words, estimates will be made of the fiscal advantages to be obtained _if_ libraries were to cooperate in collection acquisition and management without exploring the details of _how_ such cooperation could be effected. Two of many possible advantages of this cooperation are costed:

a. Storing centrally seldom used books.

b. Avoidance of purchasing duplicate copies of seldom used books.

Since data available concerning both matters are very sketchy, only general estimates can be made.

4.2.1 A Central Store for Seldom Used Books

Calculations here involve computing the cost of maintaining low circulation volumes under each of three systems; the present system, a regional network following boundaries suggested in the Becker and Hayes report,[1] and a state-wide network. Low circulation volumes are defined as those having circulation rates of less than one per year. As suggested by Locke,[2] maintenance costs are estimated to be $.20 per volume per year. No distinction is made in costs between the three configurations or for the different types of libraries.

The computer program developed to perform the calculations is discussed in Appendix F. Input data to the program giving titles, regional unique titles, and state unique titles for each library are shown in Figure F.2.

For the present system low circulation volumes are estimated to be 50% of titles in each library. The 50% is based on data presented in the preceding section and is intended only to permit establishment of the general magnitude of costs involved. Costs for each library are the number of low circulation volumes multiplied by the $.20 per year maintenance cost.

In the regional network calculation it is assumed that low circulation volumes are maintained only in one location in the region and that these volumes are shared by all libraries in the region. The number of low circulation volumes maintained in these single locations is estimated to be 50% of regional unique titles in each library. Costs of maintenance, again, are $.20 per volume.

For the state-wide network, it is assumed that low circulation volumes are maintained only in one location and that these volumes are shared by all libraries in the state. The number of low circulation volumes maintained in these single locations is estimated to be 50% of state-wide unique titles in each library. Maintenance costs are $.20 per volume.

A summary of cost by type of library for the three system configurations is given in Table 4.10. Because of the nature of the calculation, the totals shown should be considered to indicate only the magnitude of likely cost changes. Further development of data and the estimation procedure would allow much more confidence to be placed in the results. The program calculates low circulation maintenance costs for all three configurations on the basis of titles currently in each library. Since it is likely that low circulation volumes would be centralized under the regional and state-wide configurations, actual costs would be distributed somewhat differently than shown by the program although total costs would remain the same. As shown in Table 4.10, potential savings are possible of $165,000 per year if a regional network is adopted and $350,000 if a state-wide network is adopted.

4.2.2 Avoidance of Purchasing Duplicate Copies of Seldom Used Books

Available data are so scanty, estimates must be very conservative. Tables in this chapter and Appendix B provide the following:

a. Central Washington State College Library. 67% of available book titles did not circulate in an 18-month period.

b. Bellingham Public Library. 61% of available book titles did not circulate in a 3-month period.

c. Washington State Library. 66% of a sample of available book titles did not circulate in 1969. 70% of a sample of available book titles did not circulate in 1968. 69% of a sample of available titles did not circulate during the first year after publication.

With circulation rates per available volume considerably greater in public libraries than in academic and research libraries, a conservative estimate is that 20% of titles purchased do not circulate within one year after their addition to the average library.

Cooperative acquisition programs at either the network regional or state levels would identify and defer purchase of all duplicate copies of potentially low circulating volumes (less than one projected circulation in the first year after addition). One copy of these low circulating titles would be available within the geographic bounds of the cooperating libraries.

Table 4.11 shows the cost of purchasing low circulation volumes within each of three system configurations. An average volume to title ratio of 1:1 is used. The average cost of a volume is estimated

TABLE 4.10
TOTAL ANNUAL LOW CIRCULATION VOLUME MAINTENANCE COSTS

LIBRARY TYPE	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Public Libraries:			
Region 1	$15,340	$10,291	$ 285
Region 2	14,788	6,197	464
Region 3	18,722	9,753	342
Region 4	25,759	18,073	1,078
Region 5	57,990	23,702	21,615
Region 6	19,587	14,610	479
Region 7	25,651	7,715	420
Region 8	17,318	7,187	566
Region 9	9,507	8,140	184
Region 10	33,268	20,739	3,609
Region 11	11,090	4,517	208
Region 12	26,852	13,090	508
STATE TOTAL	$275,872	$144,014	$ 29,758
University of Washington	70,914	70,914	70,914
Washington State University	28,305	28,305	8,126
Western Washington State College	12,001	12,001	969
Central Washington State College	11,000	11,000	447
Eastern Washington State College	8,736	5,630	174
Community Colleges	40,836	12,343	774
Washington State Library	14,607	14,607	1,681
TOTALS	$462,271	$298,814	$112,843

volumes maintained in these single locations is estimated to be 50% of state-wide unique titles in each library. Maintenance costs are $.20 per volume.

A summary of cost by type of library for the three system configurations is given in Table 4.10. Because of the nature of the calculation, the totals shown should be considered to indicate only the magnitude of likely cost changes. Further development of data and the estimation procedure would allow much more confidence to be placed in the results. The program calculates low circulation maintenance costs for all three configurations on the basis of titles currently in each library. Since it is likely that low circulation volumes would be centralized under the regional and state-wide configurations, actual costs would be distributed somewhat differently than shown by the program although total costs would remain the same. As shown in Table 4.10, potential savings are possible of $165,000 per year if a regional network is adopted and $350,000 if a state-wide network is adopted.

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b. Bellingham Public Library. 61% of available book titles did not circulate in a 3-month period.

c. Washington State Library. 66% of a sample of available book titles did not circulate in 1969. 70% of a sample of available book titles did not circulate in 1968. 69% of a sample of available titles did not circulate during the first year after publication.

With circulation rates per available volume considerably greater in public libraries than in academic and research libraries, a conservative estimate is that 20% of titles purchased do not circulate within one year after their addition to the average library.

Cooperative acquisition programs at either the network regional or state levels would identify and defer purchase of all duplicate copies of potentially low circulating volumes (less than one projected circulation in the first year after addition). One copy of these low circulating titles would be available within the geographic bounds of the cooperating libraries.

Table 4.11 shows the cost of purchasing low circulation volumes within each of three system configurations. An average volume to title ratio of 1:1 is used. The average cost of a volume is estimated

TABLE 4.10
TOTAL ANNUAL LOW CIRCULATION VOLUME MAINTENANCE COSTS

LIBRARY TYPE	SYSTEM CONFIGURATION					
	PRESENT SYSTEM		REGIONAL NETWORK		STATE-WIDE NETWORK	
Public Libraries:						
Region 1	$15,340		$10,291		$ 285	
Region 2	14,788		6,197		464	
Region 3	18,722		9,753		342	
Region 4	25,759		18,073		1,078	
Region 5	57,990		23,702		21,615	
Region 6	19,587		14,610		479	
Region 7	25,651		7,715		420	
Region 8	17,318		7,187		566	
Region 9	9,507		8,140		184	
Region 10	33,268		20,739		3,609	
Region 11	11,090		4,517		208	
Region 12	26,852		13,090		508	
STATE TOTAL		$275,872		$144,014		$ 29,758
University of Washington		70,914		70,914		70,914
Washington State University		28,305		28,305		8,126
Western Washington State College		12,001		12,001		969
Central Washington State College		11,000		11,000		447
Eastern Washington State College		8,736		5,630		174
Community Colleges		40,836		12,343		774
Washington State Library		14,607		14,607		1,681
TOTALS		$462,271		$298,814		$112,843

TABLE 4.11
TOTAL ANNUAL LOW CIRCULATION VOLUME PURCHASE COSTS

ALL TYPES OF LIBRARIES BY REGION	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Region 1	$ 10,762	$ 6,727	$ 196
Region 2	16,595	10,649	1,110
Region 3	9,248	4,708	158
Region 4	19,754	12,869	800
Region 5	65,155	44,670	43,230
Region 6	12,428	8,775	291
Region 7	28,646	14,469	1,037
Region 8	19,138	11,617	666
Region 9	7,261	5,550	123
Region 10	18,483	11,591	1,602
Region 11	15,636	13,028	3,309
Region 12	16,549	8,140	300
TOTALS	$239,655	$152,793	$52,822

at $4.00. Present system costs are established as the product of $4.00 times 20% of the number of titles added to libraries within each region during 1969. Regional network costs are similarly calculated except that the costs of the low circulating titles within the region are eliminated. State-wide costs are likewise calculated but with the elimination of the costs of all low circulating duplicate copies within the state. These calculations were done by hand rather than by computer program because of time constraints.

As was the case of maintenance costs, actual costs would probably be distributed somewhat differently from the estimates but total costs would remain the same. The projections of Table 4.11 show potential savings of $87,000 if a regional network is adopted and $187,000 per year if a state-wide network is adopted.

4.2.3 Costs of Alternate Systems

Table 4.12 shows and sums the costs discussed in the two preceding sections. Potential savings in the form of released resources approximate $250,000 per year under regional networking and $536,000 per year under state-wide networking. Again, the figures indicate the magnitude of likely cost changes and are presented to illustrate the potential cost-effectiveness of the alternate system configurations.

TABLE 4.12
TOTAL ANNUAL LOW CIRCULATION VOLUME MAINTENANCE AND PURCHASE COSTS FOR ALL TYPES OF LIBRARIES

CATEGORY	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Maintenance Costs	$ 462,271	$ 298,814	$ 112,843
Purchase Costs	239,655	152,793	52,822
TOTALS	$ 701,926	$ 451,607	$ 165,665

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CHAPTER 5
ATTITUDE OF LIBRARY ADMINISTRATORS TOWARDS NETWORK

There have been many studies of innovation acceptance after the fact, but virtually none have studied the phenomenon of acceptance or rejection while the innovation was in progress. The network idea is not a particularly new one in librarianship. It is only during the last decade, however, that plans for the realization of such ideas, frequently on a large scale and utilizing advanced technology have been made in any detail. The general discussion of the scope of the proposed library network for Washington State implies a considerable effort in funds as well as technical and procedural features unlike any currently in operation in the state.

The State of Washington has a good record of cooperative library activities and there are already a number of regional public library systems. The 1967 report by Becker and Hayes outlining possible network features has been widely distributed. This has been followed up in a number of network meetings in different regions of the state, addressed to the library profession. In addition, representatives of a variety of types of library were brought together for the Lake Wilderness Conference in 1968. Therefore, there is every reason to expect widespread acceptance of the network concept among library administrators in the state.

5.1 Questionnaire Survey of Library Administrators

Information was gathered through the use of a questionnaire specially developed for this study. The questionnaire together with an explanation of some technical details of its analysis is given in Appendix E.

The design of the questionnaire and its interpretation are based largely on Nash's thesis.[1] Osgood[2] and Moreno[3] are the original sources for the methods of the semantic differential and sociometry respectively. Nash cites these two workers and discusses more recent writing on their methods at some length as well as the derivation of the communications categories used in Section 5.4.

5.1.1 Content

Working with the assumption that favorable opinion and acceptance were correlates, it was decided to measure the opinion of library administrators toward the network and some of its possible component parts. The opinion gathering technique was the semantic differential. Opinions were gathered on the following aspects of the network:

a. Network concept as a whole.
b. Concept of regional centers.
c. Concept of one central facility or switching center.
d. Concept of type of library centers.

e. Interlibrary loan concept.
f. Centralized processing concept.
g. Collection management concept.
h. Facsimile transmission concept.
i. Universal reference service concept.
j. Union list production concept.

It can be seen that (a) is concerned with the overall impression of the network, (b)-(d) with various organizational forms that it might take, and (e)-(j) with various services it might offer or functions it might perform.

Each concept was measured by the use of ten sets of polar terms to discover feeling or opinion toward the concept. The polar term sets were:

a. Useful - useless
b. Rational - intuitive
c. Progressive - regressive
d. Important - unimportant
e. Expensive - inexpensive
f. Timely - untimely
g. Permissive - prohibitive
h. Possible - impossible
i. Necessary - unnecessary
j. Central - peripheral

On the questionnaire the positive and negative poles were shifted randomly (in fact b, d, e, f, g, and j were reversed). Each set of polar terms used had a seven place scale representing total acceptance (7) through neutrality (4) to total rejection (1).

Basic information about the libraries and librarians responding was obtained. This information may be divided into four categories:

a. Basic data on libraries - type of library, support, geographic area, population served, size of collection, annual expenditure, collection emphasis, clientele needs, circulation, interlibrary loans and informal interlibrary loans.

b. Basic data on librarians - communications characteristics of librarians (isolate, localite, library localite, cosmopolite, library cosmopolite, see Section 5.4) and professional status of librarians.

c. Example of expectations - current time to fill an interlibrary loan request, estimated desirable, realistic times for 1970, 1973, 1975.

d. Network related data on librarians - participation (would the respondent like his library to participate in the network), recommendation (would his library concur with his recommendation), discussion of network, source of best information on the network and familiarity with network concept.

To attempt to discover patterns of interpersonal influence, several sociometric questions were asked of each library administrator:

a. With whom do you discuss significant library administrative matters?

b. From whom did your most reliable information come?

c. Who has been your primary discussion partner during the past year in matters relating to the network?

d. To whom would you go for additional reliable information concerning evaluation of the network concept?

Of the 140 questionnaires sent out, 129 were returned and 119 proved to be usable for computer analysis. As shown in Appendix Table E.1, the usable returns constituted a high and even proportion of the sampled universe, broken down by type of library. Interpretations made of these usable returns may therefore be considered representative of the sampled population.

5.1.2 Interpretation

As explained in Appendix E, over 2,500 two-way tables were obtained from the data, each table including table, row and column percentages, as well as values of chi-square and degrees of freedom. The row and column percentages enable the distribution of the data across the entire sample to be seen for one or another of the variables of the table. The values of chi-square and degrees of freedom enable the probability that the two variables of the table are statistically independent to be determined (from published tables of the chi-square distribution). Low values of such probability are indicators of a significant lack of statistical independence.

The discussion in Sections 5.2 and 5.3 is based upon 60 tables at the .001 level of significance (see Appendix E). Table 5.1 shows that these correlations lie mainly in four areas, within the data on libraries and acceptance and between acceptance data and basic and network-related data on librarians. The latter is striking and shows that personal not institutional characteristics correlate most strongly with acceptance or rejection of the network. Quantitative expectations in the example given correlate with nothing. A complete listing of all the significant correlations recorded is given in Appendix Table E.2. Unfortunately many of these, as reported later, have no clear interpretation.

TABLE 5.1
FREQUENCY OF SIGNIFICANT CORRELATIONS BY TYPE OF VARIABLE

	BASIC DATA ON LIBRARY	BASIC DATA ON LIBRARIAN	EXPECTATION	NETWORK-RELATED DATA ON LIBRARIAN	ACCEPTANCE
Basic Data on Library	46	2		3	2
Basic Data on Librarian	2				11
Expectation					
Network-Related Data on Librarian	3			2	8
Acceptance	2	11		8	20

(A total of 60 tables at the .001 level of significance.)

5.2 Characteristics of the Respondents and Their Libraries

The discussion is divided into five parts: basic data on libraries; basic data on librarians; example of expectations; network-related data on librarians; and evaluation of network meetings.

5.2.1 Basic Data on Libraries

Data were obtained on characteristics of the libraries of the respondents to serve as general background to interpretation of respondent's attitudes to the network. These data are summarized in Appendix E in Tables E.3a-E.3k and cover type of library, support, geographic area, population served, size of collection, annual expenditure, collection emphasis, clientele needs, circulation, interlibrary loans, and informal interlibrary loans. There are no surprises in the data and the frequent correlations between variables are to be expected on the basis of experience.

Public, special and community college libraries far outnumber college and university libraries. All public, community college, and some college and university libraries are publicly supported. Almost all special and the remainder of the college and university libraries are privately supported. Public libraries tend to serve the largest populations, have collections supporting recreation and general information and have high circulations. Academic libraries are varied in size, with community college libraries having the smallest collections and circulations. Academic libraries have collections which are mainly curriculum supportive, have a relatively high rate of interlibrary loan, and are relatively more likely to have discussed the network outside of scheduled meetings. Special libraries present a picture of small research and special subject collections, low circulations, and are relatively unlikely to have discussed the network outside of scheduled meetings.

The geographical distribution of the respondents' libraries is not at all even. Considering the suggested twelve network regions, King County has 25% of the state total, another four regions have 43% of the total, seven small regions make up the remaining 32%.

Most of the respondents' libraries serve medium-small or small populations. Large populations account for the largest collections, annual expenditures, and circulations. The respondents from small libraries are the only ones who would not like their library to join the proposed network.

The respondents' libraries have a variety of collection sizes. Large and medium-large collections are general information in emphasis and small collections in the sample are research oriented. The larger the collection, the greater is circulation, interlibrary loan, and the degree of familiarity with the network.

Over half the respondents' libraries have annual expenditures of over $100,000. Nonprofessionals administer almost all libraries in the sample with small expenditures.

Collection emphasis of the respondents' libraries is fairly evenly distributed between research, recreation, curriculum support, general information and special subject. This distribution is closely correlated with stated clientele needs. With one exception, research and special subject emphasis account for the lowest circulation. Recreation and general information account for the highest circulation.

5.2.2 Basic Data on Librarians

Data on two characteristics of the respondents as individuals, whether or not they are professional librarians, and their communications category were obtained (see Section 5.4 for explanation of terms). There is considerable correlation between these two characteristics and the degree of acceptance measured by the semantic differential (see Table E.2).

Table 5.2a shows the distribution of the respondents' communications categories. There is only one in the cosmopolite category, and he is ignored in Section 5.4. Otherwise the categories are fairly evenly distributed. In terms of attitude toward the network, isolates and library cosmopolites are strongly positive, but localites and library localites are more neutral. The library cosmopolite is also strongly positive to the concept of collection management.

Table 5.2b shows the distribution of the respondents by professional status. About one in seven is not a professional librarian. Professionals are much more positive than nonprofessionals about some network functions.

5.2.3 Example of Expectations

Table 5.3a shows the distribution of current interlibrary loan times reported by the respondents. Table 5.3b shows three sets of "functionally realistic" estimates made by the respondents for 1970, 1973, and 1975. It is interesting to see the systematic improvement in expectations. The percentage of loans taking less than 8 days moves from 64 percent in 1970 through 86 percent in 1973 to 91 percent in 1975. The percentage taking 3 days or less follows the sequence 13, 36, to 68 percent.

5.2.4 Network-Related Data on Librarians

Respondents reply nine to one in favor of their library participating in the network (Table 5.4a). It is only the respondents from libraries serving small populations that would not like their library to join the network. On both the general network concept and that of union lists participants are consistently more positive than non participants.

About one in six of the respondents believes that his library would not concur in his statement on participation (Table 5.4b). This minority is relatively negative to the concept of collection management.

Only 40 percent of the respondents have discussed the network outside of scheduled meetings (Table 5.4c). Discussants are relatively more likely to be from academic libraries and to be more familiar with the network concept. Nondiscussants are more likely to be from special libraries.

Table 5.4d shows the distribution of the respondents' best source of information on the network. Personal-written communication is not significant; otherwise written-published and oral-group are comparable and ahead of oral-personal.

Table 5.4e shows the distribution of the respondents' expressed familiarity with the network. In general, the familiarity claimed is not great. Those more familiar with the network are more likely to discuss the network outside of scheduled meetings and/or to come from libraries with large collections.

5.2.5 Evaluation of Network Meetings

Shortly after the Becker and Hayes report was published in 1967, a number of network meetings were held around the state in an

TABLE 5.2a
BASIC DATA ON LIBRARIANS--COMMUNICATIONS CHARACTERISTICS

COMMUNICATIONS TYPE*	NUMBER OF LIBRARIANS	PERCENT
Isolate	26	22
Localite	36	31
Library Localite	17	14
Cosmopolite.	1	1
Library Cosmopolite . . .	38	32
TOTAL	118	100

*For derivation of type see Section 5.4

TABLE 5.2b
BASIC DATA ON LIBRARIANS --PROFESSIONAL STATUS

PROFESSIONAL STATUS	NUMBER OF LIBRARIANS	PERCENT
Professional	101	86
Nonprofessional	16	14
TOTAL	117	100

TABLE 5.3a
EXAMPLE OF EXPECTATIONS--CURRENT INTERLIBRARY LOAN TIME

CURRENT INTERLIBRARY LOAN TIME	NUMBER OF RESPONDENTS	PERCENT
0-3 days	5	5
4-7 days	26	26
8-14 days	38	38
15-30 days	25	25
Over 30 days	6	6
TOTAL	100	100

TABLE 5.3b
EXAMPLE OF EXPECTATIONS--FUTURE INTERLIBRARY LOAN TIMES

FUTURE INTERLIBRARY	1970		1973		1975	
LOAN TIMES	# RESPOND	%	# RESPOND	%	# RESPOND	%
1 day	3	4	8	10	24	31
2-3 days	6	9	21	26	28	37
4-7 days	34	51	41	50	18	23
Over 8 days	24	36	12	14	7	9
TOTAL	67	100	82	100	77	100

TABLE 5.4a
NETWORK-RELATED DATA ON LIBRARIANS--PARTICIPATION

WOULD LIKE LIBRARY TO PARTICIPATE	NUMBER OF RESPONDENTS	PERCENT
Yes	101	89
No	12	11
TOTAL	113	100

TABLE 5.4b
NETWORK-RELATED DATA ON LIBRARIANS--RECOMMENDATIONS

BELIEVE LIBRARY WOULD CONCUR IN RECOM. ON PARTICIPATION	NUMBER OF RESPONDENTS	PERCENT
Yes	93	84
No	18	16
TOTAL	111	100

TABLE 5.4c
NETWORK-RELATED DATA ON LIBRARIANS--DISCUSSION

HAVE TAKEN PART IN DISCUSSION OF NETWORK OUTSIDE OF SCHEDULED MEETINGS	NUMBER OF RESPONDENTS	PERCENT
Yes	47	40
No	70	60
TOTAL	117	100

TABLE 5.4d
NETWORK-RELATED DATA ON LIBRARIANS--BEST INFORMATION

SOURCE OF BEST INFORMATION	NUMBER OF RESPONDENTS	PERCENT
Written Personal	3	3
Written Published	40	41
Oral Personal	17	17
Oral Group	39	39
TOTAL	99	100

TABLE 5.4e
NETWORK-RELATED DATA ON LIBRARIANS--FAMILIARITY WITH NETWORK

FAMILIARITY WITH NETWORK*	NUMBER OF LIBRARIES	PERCENT
7	5	7
6	10	14
5	12	16
4	15	20
3	11	15
2	13	18
1	7	10
TOTAL	73	100

*The scale ranges from extremely familiar (7) to completely unfamiliar (1).

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effort to familiarize the profession with the proposed network. As an ad hoc addition to the present study, a list of names of attendees was obtained and used to classify respondents as attendees or nonattendees while maintaining confidentiality. Correlation tables were constructed between attendance and discussion, familiarity and network (mean scale) variables with the following results. Attendees were more likely than nonattendees to have discussed the network outside of scheduled meetings with a chi-square significance level of .1. They were more familiar with the network at a significance level of .05. (Neither of these levels are strongly significant.) They were more positively in favor of the network at a significance level of .90, i.e., completely nonsignificant. Therefore, attending the network meetings increased the likelihood of discussion and familiarity with the network, but did not persuade in favor of the network. The meetings had a stimulating, informative character, rather than persuasive.

5.3 Acceptance of Network Concept

For each question concerning a network function ten scales were marked, each with a value from 7 (strong acceptance) through 4 (neutrality) to 1 (strong rejection). For each question these were averaged for a "mean response" scale. The distribution of these mean responses is shown in Table 5.5 together with the mean of the mean for each function, and the overall mean for all scales. The distribution of original scale values for each function is shown in Table 5.6 together with the same means. The distribution of original scale values for each scale of the semantic differential is shown in Table 5.7, together with the same means.

Comparing Tables 5.5 and 5.6 there is a clear difference in the distributions. Distributions of the mean responses in Table 5.5, individually and in the mean, have extremely low values for acceptance values 1, 2, 3 and typically peak at acceptance values of 5 or 6. However, distributions of original scale values, and also their mean, in Table 5.6 have higher values for acceptance values 1, 2, 3 and frequently peak at acceptance values of both 4 and 7. The distribution in Table 5.6 arises from two factors in the responses--one of increasing frequency of positive feeling and the other of neutrality or uncertainty. When these are superimposed there are peaks at 4 and 7. In the case of Table 5.5, however, at the time of averaging to obtain the mean response to a function, the tails of the distribution are drawn towards the center, since ten checks of scale value 1 or 7 are not likely, and so extreme values of individual scales are eliminated in the mean. The difference in row means arises from rounding and is not significant. To summarize, the population is generally in favor of the network, but there is a significant component that is either neutral or uncertain about it.

Using the figures of Table 5.6, acceptance of different network

TABLE 5.5
ACCEPTANCE OF NETWORK FUNCTIONS (MEANS)

The figures are percentages of total responses which vary from 105 to 109 for the various functions.

NETWORK FEATURE	ACCEPTANCE*							MEAN
	1	2	3	4	5	6	7	
Network	0	0	0	7	24	55	14	5.76
Regional Centers	0	1	1	9	35	46	8	5.48
Central Facility	0	1	8	18	30	34	9	5.15
Type of Library Cent.	0	5	13	15	30	27	10	4.91
Interlibrary Loan	0	0	2	6	18	53	21	5.85
Central Processing	0	5	10	18	30	29	8	4.92
Collection Mgt.	2	2	7	23	33	29	4	4.86
Facsimile Transmission	0	0	1	12	17	48	22	5.78
Reference Service	1	0	0	11	30	38	20	5.63
Union Lists	0	0	1	8	13	51	27	5.95
MEAN	0	1	4	13	26	41	15	5.47

* The acceptance scale is the mean of the ten individual scales of the semantic differential, averaged for each question, and ranges from strong acceptance (7) through neutrality (4) to strong rejection (1).

TABLE 5.6

ACCEPTANCE OF NETWORK FUNCTIONS (FREQUENCIES)

The figures are percentages of total responses which vary from 105 to 109 for the various functions.

NETWORK FEATURE	ACCEPTANCE*							MEAN
	1	2	3	4	5	6	7	
Network	1	2	3	14	12	28	40	5.78
Regional Centers	1	2	3	17	19	26	32	5.57
Central Facility	3	4	7	20	19	22	28	5.20
Type of Library Center	8	7	5	21	14	18	27	4.68
Interlibrary Loan	2	3	3	13	10	16	53	5.86
Central Processing	6	6	5	21	16	18	28	5.01
Collection Mgt.	4	5	6	27	19	19	20	4.89
Facsimile Transmission	2	1	3	17	8	18	51	5.86
Reference Service	1	2	3	18	14	21	41	5.69
Union Lists	0	1	2	14	11	21	51	6.02
MEAN	3	3	4	18	14	21	37	5.48

* The acceptance scale shows the percentage frequency of obtaining scale values shown for each network function.

functions can be compared. The network concept as a whole has a mean of 5.78. In the questionnaire the next three questions are related to possible forms or configurations the network might take. These rank in descending order of acceptance by mean:

5.57	Regional Centers
5.20	Central Facility
4.68	Type of Library Center

The remaining questions are presented in the questionnaire as dealing with possible functions or services of a network. They rank in descending order of acceptance by mean:

6.02	Union Lists
5.86	Facsimile Transmission
5.86	Interlibrary Loan
5.69	Reference Service
5.01	Central Processing
4.89	Collection Management

It is interesting to see the strength of functions associated with interlibrary loan and the positions of central processing and collection management.

Strongest relative support for the overall network concept comes from those who would like their library to participate and/or who are library cosmopolites or isolates. Library localites and localites tend to be more frequently neutral on the concept. The only clear correlation with the concept of regional centers is that professionals are more positive than nonprofessionals. The concept of collection management is most strongly supported by library cosmopolites and isolates. Professionals are more strongly in favor of facsimile transmission than nonprofessionals and the same is true for reference services via the network. Both professionals and those who would like their library to join the network are much more positive about the concept of union lists.

5.4 Interpersonal Influence

Four sociometric questions were asked in the questionnaire.

a. With whom do you discuss significant library administrative matters?

b. From whom did your most reliable information come?

c. Who has been your primary discussion partner during the past year in matters relating to the network?

d. To whom would you go for additional reliable information concerning evaluation of the network concept?

On the basis of answers to these four questions, respondents were assigned a communications characteristic or type, defined as follows:

> Isolate. A librarian who has no interaction with others on matters pertaining to the administration of his library.
>
> Localite. A librarian who has the major part of his contacts pertaining to the administration of his library with local nonlibrarian individuals.
>
> Library Localite. A librarian who has the major part of his contacts pertaining to the administration of his library with local librarians.
>
> Cosmopolite. A librarian who has the major part of his contacts pertaining to the administration of his library with nonlocal, nonlibrarian individuals.
>
> Library Cosmopolite. A librarian who has the major part of his contacts pertaining to the administration of his library with nonlocal librarians.

The derivation of these terms is described in detail in Nash's thesis.[1] There was only one respondent in the cosmopolite category and this category is therefore ignored in what follows.

The distribution of the respondents by mean communications characteristic is given in Table 5.2a. An analysis of the responses for each question separately leads to Table 5.7. Here respondents are separately characterized for each question, depending on their answer. As can be seen from the answers to the last three questions, there has not been much discussion of the network.

Comparing breakdowns by type of library (which are not shown), patterns of communication are very similar across all types of library. Librarians tend to stick to their own kind. Community college librarians go to community college librarians and public librarians to public librarians. The only interlibrary agency showing any significant influence across type of library lines is the State Library (55 times). Geographic proximity seems to play a very limited role. Discussion partners are fairly random. It had been hoped to identify a small number of influential partners but this does not seem to be the case. The influence of any one individual is minimal.

In the area of general administrative discussions, Table 5.7 shows a large proportion of localites. They go to local individuals for assistance and consultation. These individuals are not librarians but local board members, city officials, faculty committee members or others who are directly responsible for the policy and financial backing of the library. This points up the factor of lay participation in the decision-making process.

TABLE 5.7
COMMUNICATIONS CHARACTERISTICS AND ADMINISTRATORS' ACTIVITIES

ACTIVITY	ISOLATE	LOCALITE	LIBRARY LOCALITE	LIBRARY COSMOPOLITE	TOTAL
General Discussion	19	59	15	24	117
Network Information	20	1	3	34	58
Network Discussion	25	3	10	20	68
Network Evaluation	12	1	0	41	54

In the area of network information, Table 5.7 shows that respondents are almost evenly split between library cosmopolites, seeking their information from agencies such as the State Library, and isolates finding answers for themselves. In this area there is very little reliance on other local librarians or their own governing bodies. This same pattern is followed in the question of finding additional evaluative information about the network. In the area of network discussion, there is still a large proportion of isolates and library cosmopolites.

Another interpretation of Table 5.7 is that the answers to each question are essentially the same but that localites are almost entirely unfamiliar with the network and so drop out from the last three questions.

In summary then, if the returns are representative, it is clear that the network is not like ordinary, routine administrative business. Dependencies and communication characteristics of librarians change considerably between routine tasks and network matters.

5.5 Significant Points

Personal and not institutional characteristics correlate most strongly with acceptance or rejection of the network. In particular, professional status as opposed to nonprofessional and an affirmative answer to the question, "Would *you* like your library to participate in the network?" were strongly indicative of positive acceptance.

The survey showed the expected institutional correlates quite clearly, involving such variables as size of collection, population served, type of library, collection emphasis, clientele needs, and circulation.

Together with some *ad hoc* data on attendance at the network meetings of 1967-68 designed to inform the profession about the network, the survey showed that they served an informative purpose.

Acceptance of the network is widespread as measured by the semantic differential. Possible configuration alternatives offered in the questionnaire rank in descending order of acceptance (and considerably spread out): regional centers, central facility, and lastly type of library center. Possible functions or services that a network might perform rank in descending order of acceptance: union lists, facsimile transmission, interlibrary loan, reference service, central processing, and collection management. The first four are fairly close but the last two are very far down.

Interpersonal communications categories can be set up for each respondent. Localites, perhaps as expected, seem completely unfamiliar with the network. Another slightly different interpretation is that nobody is localite when it comes to the network and very few even are library localites. They become isolates and go it alone or library cosmopolites and link up with others outside their community.

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CHAPTER 6
SUMMARY

In previous chapters separate analyses have been presented of likely effects of implementing either a regional network or a state-wide network. Both the regional and state-wide network concepts imply that there would be some centralization of activities. For a regional network one library in each region would serve as a focal point for performance of network functions; for the state-wide network one library in the state would serve as the focal point. If either configuration is adopted over the present system, the functions of interlibrary loan, technical services, and collection management would be facilitated through new organizational arrangements. It is essential to consider the consequences in terms of both costs and benefits and their distribution among participating libraries.

6.1 Costs of Alternate Systems

Total annual costs associated with interlibrary loan, technical services, and collection management for the three system configurations are shown in Table 6.1.[1] In terms of the three functions that have been analyzed, both the regional and state-wide networks indicate cost differentials with respect to the present system. The regional network offers a differential of $575,000 with respect to the present system consisting of $325,000 in technical services and $250,000 through collection management -- a total change of 20% from costs of the present system. The state-wide network offers a differential of $1,215,000 with respect to the present system consisting of $680,000 in technical services and $535,000 through collection management -- a total change of 43% from costs of the present system.

TABLE 6.1
TOTAL ANNUAL COSTS FOR ALTERNATE SYSTEM CONFIGURATIONS

FUNCTION	SYSTEM CONFIGURATION		
	PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Interlibrary Loan	$ 195,000	$ 195,000	$ 195,000
Technical Services	1,945,000	1,620,000	1,265,000
Collection Management	700,000	450,000	165,000
TOTALS	$2,840,000	$2,265,000	$1,625,000

These cost differentials are based only on current levels of activity. Development of either a regional network or state-wide network would have at least two significant effects on levels of activity in the system and the costs shown in Table 6.1. Interlibrary loan costs can be expected to rise due to an increase in level of activity resulting from improved service. The second significant effect stems from elimination of low circulation volumes from local libraries if either network configuration is implemented. If equal service is maintained, some of these volumes would be obtained through interlibrary loan from the regional or state-wide library which maintains the collection of low circulation volumes. Available data are not adequate to determine additional interlibrary loan activity generated from these two sources, but it is reasonable to assume that a doubling or tripling of current activity levels might occur. For purposes of discussion, it is assumed that interlibrary loans double to approximately 70,000 for the regional network and triple to 105,000 per year for the state-wide network.

In both the regional and state-wide network configurations additional communication costs are incurred because of centralization of activities. While details of the communications systems that might be used have not been investigated, an implicit assumption in all discussions of the network concept has been that more sophisticated systems than present mail and occasional telephone communication would be used. Primary traffic on a communications system would be due to interlibrary loan activity and technical services. As suggested in the preceding paragraph, interlibrary loan might generate 70,000 transactions per year for the regional network and 105,000 transactions for the state-wide network. In the technical services area, a total of 745,000 volumes and 300,000 titles are processed per year. These numbers have to be handled regardless of whether a network is regional or state-wide. Since multiple volume orders may be handled in a single transaction, it is assumed that the number of transactions handled by the communications system is equal to the number of titles processed, that is, 300,000 per year for either the regional or state-wide network. Without specifying details of procedures or the nature of communications equipment to be used, estimates of cost per transaction can only be guesses as to the general magnitude of actual costs that may be incurred. To incorporate this cost in the total estimate, a figure of $1.00 per transaction is used. This estimate is comparable to experience elsewhere.[2]

In Table 6.2 total annual costs from Table 6.1 have been adjusted to take into consideration increased interlibrary loan activity for the regional and state-wide networks and communications costs. With these additional costs considered, the differential between the present system and the regional network is slight, and for the state-wide network it is reduced to $420,000.

Cost data in Tables 6.1 and 6.2 should be regarded as gross estimates of costs of actual operations. Accurate cost estimates are impossible to make since basic data on current library operations are fragmentary, and it has been impossible within the bounds of this research project to specify in detail the operating systems that might

TABLE 6.2
ADJUSTED TOTAL ANNUAL COSTS FOR ALTERNATE SYSTEM CONFIGURATIONS

FUNCTION	SYSTEM CONFIGURATION PRESENT SYSTEM	REGIONAL NETWORK	STATE-WIDE NETWORK
Interlibrary Loan	$ 195,000	$ 390,000	$ 585,000
Technical Services	1,945,000	1,620,000	1,265,000
Collection Management	700,000	450,000	165,000
Network Communications	--	370,000	405,000
TOTALS	$2,840,000	$2,830,000	$2,420,000

be used in the regional and state-wide networks. Also, collection management costs include only low circulation volume acquisition and maintenance costs and do not include all acquisition and maintenance costs for collections in the state. These may well be on the order of $5,000,000 per year.[3] Accordingly, when uncertainty in the cost estimates and the magnitude of all costs are taken into consideration, cost differences between systems revealed by this study do not appear to be sufficient to permit a choice to be made between the present system, a regional network, or a state-wide network on the basis of cost alone. Essentially, the results indicate that total operating costs of the three systems are similar, although the distribution of costs among libraries would be different for the three configurations.

6.2 Benefits from Alternate Systems

Benefits have not been assessed quantitatively since the major effort in the research study has been to determine costs of operation of alternate systems which provide at least the current level of service. However, some numeric information is available to indicate that improvements in service would take place with either network configuration. Currently, most resources in the state are presumably available to any library in the state through interlibrary loan. However, the process of locating and obtaining materials does not encourage widespread use of all resources in the state. For most patrons readily available materials are those in the local library and, while other materials may be available through interlibrary loan, this is not an important source of materials.[4] With either network configuration, resources in other libraries would be readily available with libraries sharing regionally in the regional network and state-wide in the state-wide network. The regional configuration would make available from 99,000 to 959,000 titles depending on the region. For the state-wide network, all titles in the state -- a total of 1,129,000 titles -- would be readily available to all libraries. Both network configurations offer the likelihood of increases in available titles with the state-wide network offering the greatest increase.

In the preceding section, cost differentials for the performance of certain functions between alternate systems were discussed. These differentials will not be realized as cost savings directly. Instead, the result will be released resources to be applied to library services at the local level.

The two network configurations not only provide for wider availability of resources than at present, but they also offer greater growth potential for future development of library services. Higher volumes of activity and larger organizational units resulting from implementation of a network would allow adoption of modern technology, automation of certain activities, and use of more highly trained and specialized personnel. Improved planning of acquisition of materials through the network would also result in better use of the funds now available. While either the regional or state-wide network configuration offers potential for improvements, the state-wide network affords the greatest opportunity for long-run increases in effectiveness. Because of the uneven distribution of resources and population in the state, a regionally oriented network does not result in operations of sufficient size in many regions to produce benefits that would be obtained by a state-wide network.

Since cost estimates for alternate system configurations do not result in significant differences between the present system and the two network configurations, selection of a preferred alternative rests on an assessment of relative benefits of the different systems. Evaluation of benefits is, of course, much more subjective than calculation of costs. However, this evaluation is crucial to the establishment of a rational base for future development of library services in the state.

6.3 Future Research and Development

The present study has illustrated the application of quantitative modeling to library operations in the state and has resulted in some simple models and operational concepts. Library functions of interlibrary loan, technical services, and collection management have been identified and described. Alternate system configurations -- the present system, a regional network, and a state-wide network -- have been analyzed, and costs and benefits associated with each of these system alternatives have been compared. The concepts used are elementary and unsophisticated, and future studies in this state or elsewhere must seek to refine them.

This research has also demonstrated the need for a more extensive and reliable data base regarding library operations in the state. While expenditures in excess of $25,000,000 are made annually on library services in the state of Washington, data that are available on resulting operations and their effectiveness are incomplete and difficult to coordinate. Much of the data used in this study were not available from existing reports and had to be obtained from field studies and estimates made during the course of the project. The analyses that have been performed suggest the type of managerially and analytically oriented data which are required to evaluate library operations. Efforts should be made in the future to collect and evaluate this type of data on a regular basis.

In addition to these general tasks of refining the models and systematizing data collection, additional analyses should be undertaken to fill out and complete this study.

All discussion of regions in this report and all regional analyses follow geographical outlines used in the Becker and Hayes report.[5] These boundaries, in turn, follow the geographical boundaries originally suggested by Bowerman[6] and are not necessarily optimal. Some regions are small relative to others and, in view of modern highway and communications systems, can be combined with others to make units of more reasonable size. Although one alternative consisting of five regions was developed during the course of this project, there was insufficient time to perform any analysis of this regional structure. Further analyses should be performed to determine rational boundaries for regions other than the ones that have been utilized throughout this study.

If a network is implemented, all costs and benefits will not be realized immediately. Instead, there will be a gradual change as the system develops. Also, costs and benefits will not be equally distributed to all units in the system. A clearer idea of the rate at which costs and benefits develop and the way in which costs are redistributed is required to develop funding policies and realistic expectations of network benefits.

Another question about which nothing has been said is the cost associated with converting to a particular network configuration. The study has been primarily concerned with operating costs. Estimates must be made of initial costs of setting up a network, such as investment in computer hardware and other equipment,[7] development of procedures and software, employee training, and so forth.

Finally, the estimates of communications costs and flows in section 6.1 are only a first approximation. A major residual task is to refine these figures.

REFERENCES

1. See Tables 2.7, 3.4, 4.10, 4.11, and 4.12 for further cost breakdowns.

2. This cost per transaction is of the same magnitude as those that have been actually realized in the Texas network. See Preliminary Evaluation, Texas State Library Communication Network, 1968. Austin, Texas State Library, Field Services Division, 1969 pp. 13-14

3. Total collection management costs were not studied in detail. The $5,000,000 estimate is derived from the costs of maintainin approximately 10,000,000 volumes in the state at a cost of $.20 per volume per year and acquiring 750,000 volumes per year at $4.00 per volume.

4. Interlibrary loans represent a fraction of one percent of total library circulation.

5. Becker, J. and R. M. Hayes. A Proposed Library Network for Washington State. Olympia, Washington State Library, 1967

6. Bowerman, C. E. A Proposed Regional Library Plan for the State of Washington. Olympia, Washington State Library, 1950

7. Appendix D, for example, suggests that operating costs can be reduced through investment in the automation of certain technical services.

PART II: APPENDICES

APPENDIX A
BOOK COLLECTION CHARACTERISTICS

Data presented in this appendix are concerned with the description and enumeration of library book holdings. Analyses are provided by subject, age, and overlap between collections.

A.1 Basic Methodology

The number of titles held by subjects (Tables A.4-A.7) were derived from measurements of shelf lists in the various libraries studied. Ruler measurements were made to the nearest .1 inch and results were recorded. Not less than five card groups were pulled from each of the shelf list, the cards counted, the cards per inch calculated for each group, and the average number of cards per inch for the shelf list was determined. This number multiplied by the inches of cards per subject provided the number of estimated titles for each subject.

A.2 Correlation Tables - L.C. and Dewey Classifications

A comparison of book holdings is difficult if not impossible when some collections are cataloged in the Library of Congress classification system and others are cataloged in the Dewey Decimal classification. In order to make such comparison possible, a series of matrices were developed by which data arrayed by classification scheme in either the Dewey or L.C. system is convertible to the other. This was achieved by computer analysis of MARC records for titles classified in both systems by the Library of Congress.

The titles appearing on MARC tapes issued from July 2, 1969 to July 3, 1970 (Volume 1, No. 15 through Volume 2, No. 16) were selected as a data base. A program was designed to translate the MARC data which is in ASCII format into EBCDIC format for use in the Washington State Data Processing Center with COBOL programming. A second program exploded the records, extracted the call numbers, did the appropriate countings and calculations and formated the output into matrices. In this process it was found that of the 62,886 catalog records, 270 contained no LC number and 3,502 contained no Dewey number. Eliminating these records produced a data set of 59,115 records meeting correlation requirements. Listings for both programs are given in Figures A.1 and A.2.

The Major Matrix, Table A.1, shows the correlation of single letter LC classes with hundred groups in Dewey, e.g., 100's, 200's, etc. Of the 210 possible correlations, it can be seen that there were no correlations (no matches) for only 21. The table is read as follows. Catalog records for 6,943 titles were found which were classed by the Library of Congress in both H (LC) and in the 300's (Dewey). These

6,943 records were 11.7% of the 59,115 records analyzed (lower right corner). There were 8,532 "H" classed records in total (sum of the horizontal row). There were 17,530 "300's" classed records in total (sum of the vertical column).

For each of the correlations shown in the Major Matrix, Table A.1, a minor matrix was developed showing correlations between two-letter L.C. classes, e.g., HA, HB, etc., and Dewey "ten's" classes, e.g., 310's, 320's, etc. One of these 189 minor matrices is duplicated in Table A.2, Minor Matrix H3. The table is read as follows. Catalog records for 7 titles were found which were classed in both HA(LC) and in Dewey classes, the first two digits of which were 3 and 0 (300-309+). These 7 records were 6.4% of the 110 HA records (under "Total" in far right column) and .3% of the 2,203 titles classed 300-309+ (sum of the vertical column).

For the purposes of this study a translation-correlation table was necessary only at the level of single letter LC groups and Dewey hundred groups. Table A.3 was developed from Major Matrix, Table A.1, and is read as follows. Catalog records for 6,943 titles classed in both H(LC) and in the 300's (Dewey) represented 81.38% of all H classed titles of which there were 8,532 titles. This table translates from LC to Dewey but is not reversible. It was used in constructing Table 4.1 in Part I, Text of this report.

The use of correlation tables as aids in reclassification is a possibility that might merit study and testing. A number of correlations between tens level Dewey numbers and two-letter LC numbers were high. For example, 82% of the items classed in 440-449+ were classed in "PC" and 91% of the items classed in 880-889+ were classed in "PA." A table listing these high correlates might be helpful at this or at higher levels, at least to inexperienced catalogers.

MAJOR MATRIX
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TABLE A.1
WASHINGTON STATE LIBRARY
CORRELATION MATRIX COMPARING DEWEY DECIMAL AND LC NUMBERING SYSTEMS

LC	DEWEY 0	DEWEY 1	DEWEY 2	DEWEY 3	DEWEY 4	DEWEY 5	DEWEY 6	DEWEY 7	DEWEY 8	DEWEY 9	TOTAL
.				1 .0% .0%							1
/		1 .0% .0%					1 .0% .0%				2
A	117 .2% .2%	8 .0% .0%	3 .0% .0%	55 .1% .1%	4 .0% .0%	50 .1% .1%	15 .0% .0%	5 .0% .0%	8 .0% .0%	10 .0% .0%	275
B	12 .0% .0%	1209 2.0% 2.0%	2484 4.2% 4.2%	113 .2% .2%	5 .0% .0%	3 .0% .0%	19 .0% .0%	14 .0% .0%	14 .0% .0%	29 .0% .0%	3902
C	24 .0% .0%	4 .0% .0%	10 .0% .0%	30 .1% .1%	5 .0% .0%	2 .0% .0%	9 .0% .0%	63 .1% .1%	5 .0% .0%	685 1.2% 1.2%	837
D	14 .0% .0%	1 .0% .0%	16 .0% .0%	892 1.5% 1.5%	14 .0% .0%	8 .0% .0%	13 .0% .0%	53 .1% .1%	12 .0% .0%	3549 6.0% 6.0%	4572
E	14 .0% .0%	3 .0% .0%	33 .1% .1%	744 1.3% 1.3%	5 .0% .0%	4 .0% .0%	7 .0% .0%	18 .0% .0%	10 .0% .0%	929 1.6% 1.6%	1767
F	5 .0% .0%	1 .0% .0%	8 .0% .0%	225 .4% .4%	1 .0% .0%	3 .0% .0%	7 .0% .0%	15 .0% .0%	3 .0% .0%	1133 1.9% 1.9%	1401
G		10 .0% .0%	7 .0% .0%	328 .6% .6%	1 .0% .0%	237 .4% .4%	84 .1% .1%	730 1.2% 1.2%	7 .0% .0%	429 .7% .7%	1833
H	20 .0% .0%	70 .1% .1%	37 .1% .1%	6943 11.7% 11.7%		53 .1% .1%	1180 2.0% 2.0%	177 .3% .3%	8 .0% .0%	44 .1% .1%	8532
J	10 .0% .0%	5 .0% .0%	1 .0% .0%	1721 2.9% 2.9%	3 .0% .0%	2 .0% .0%	21 .0% .0%	4 .0% .0%		20 .0% .0%	1787
K	15 .0% .0%	3 .0% .0%		1637 2.8% 2.8%	1 .0% .0%	7 .0% .0%	109 .2% .2%	4 .0% .0%	1 .0% .0%	12 .0% .0%	1789
L	29 .0% .0%	36 .1% .1%	17 .0% .0%	3044 5.1% 5.1%	40 .1% .1%	6 .0% .0%	50 .1% .1%	8 .0% .0%	21 .0% .0%	7 .0% .0%	3258
M	13 .0% .0%	2 .0% .0%	1 .0% .0%	29 .0% .0%			11 .0% .0%	643 1.1% 1.1%	8 .0% .0%	1 .0% .0%	708
N	7 .0% .0%		3 .0% .0%	18 .0% .0%			9 .0% .0%	1799 3.0% 3.0%	9 .0% .0%	18 .0% .0%	1863
P	223 .4% .4%	22 .0% .0%	27 .0% .0%	261 .4% .4%	648 1.1% 1.1%	170 .3% .3%	70 .1% .1%	474 .8% .8%	8080 13.7% 13.7%	73 .1% .1%	10048
Q	63 .1% .1%	45 .1% .1%	2 .0% .0%	164 .3% .3%	5 .0% .0%	4875 8.2% 8.2%	581 1.0% 1.0%	19 .0% .0%	5 .0% .0%	14 .0% .0%	5773
R	8 .0% .0%	39 .1% .1%	5 .0% .0%	234 .4% .4%	1 .0% .0%	24 .0% .0%	1855 3.1% 3.1%	9 .0% .0%	2 .0% .0%	5 .0% .0%	2182
S	11 .0% .0%		1 .0% .0%	195 .3% .3%		89 .2% .2%	990 1.7% 1.7%	194 .3% .3%	5 .0% .0%	16 .0% .0%	1501
T	45 .1% .1%	4 .0% .0%		331 .6% .6%	2 .0% .0%	356 .6% .6%	3/90 5.9% 5.9%	299 .5% .5%	8 .0% .0%	20 .0% .0%	4555
U		1 .0% .0%		389 .7% .7%	1 .0% .0%	6 .0% .0%	58 .1% .1%	13 .0% .0%		13 .0% .0%	481
V	1 .0% .0%			138 .2% .2%		13 .0% .0%	144 .2% .2%	3 .0% .0%	1 .0% .0%	13 .0% .0%	313
W								1 .0% .0%			1
Z	1444 2.4% 2.4%	3 .0% .0%	3 .0% .0%	38 .1% .1%	3 .0% .0%	26 .0% .0%	163 .3% .3%	21 .0% .0%	16 .0% .0%	17 .0% .0%	1734
TOTAL	2075	1467	2658	17530	739	5934	8886	4566	8222	7037	59115

MINOR MATRIX H3
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TABLE A.2
WASHINGTON STATE LIBRARY
CORRELATION MATRIX COMPARING DEWEY DECIMAL AND LC NUMBERING SYSTEMS

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LC	DEWEY 0	DEWEY 1	DEWEY 2	DEWEY 3	DEWEY 4	DEWEY 5	DEWEY 6	DEWEY 7	DEWEY 8	DEWEY 9	TOTAL
A	7 6.4% .3%	63 57.3% 48.1%		17 15.5% .4%							110
B	54 15.6% 2.5%	30 8.6% 22.9%	3 .9% .2%	250 72.0% 5.7%	1 .3% .0%				1 .3% .1%		347
C	118 11.5% 5.4%	3 .3% 2.3%	10 1.0% .5%	788 76.7% 17.8%	2 .2% .1%	35 3.4% 2.1%	5 .5% .4%		25 2.4% 2.5%		1028
D	106 4.7% 4.8%		11 .5% .6%	1547 67.9% 35.0%	4 .2% .2%	102 4.5% 6.2%	66 2.9% 5.5%	5 .2% .2%	82 3.6% 8.1%		2277
E	5 .8% .2%	2 .3% 1.5%	4 .6% .2%	22 3.5% .5%		41 6.6% 2.5%	4 .6% .3%		469 75.0% 46.2%		625
F	3 .3% .1%	1 .1% .8%	4 .4% .2%	107 11.3% 2.4%	1 .1% .0%	10 1.1% .6%	4 .4% .3%	16 1.7% .8%	140 14.8% 13.8%		945
G			2 .4% .1%	378 73.1% 8.5%	1 .2% .0%	20 3.9% 1.2%	41 7.9% 3.4%		5 1.0% .5%		517
J			1 .4% .1%	150 59.8% 3.4%	2 .8% .1%	81 32.3% 4.9%	8 3.2% .7%	2 .8% .1%	3 1.2% .3%		251
M	206 88.8% 9.4%		4 1.7% .2%	1 .4% .0%			3 1.3% .2%	2 .9% .1%			232
N	258 84.9% 11.7%		7 2.3% .4%	7 2.3% .2%		3 1.0% .2%	12 3.9% 1.0%		1 .3% .1%		304
Q	249 64.0% 11.3%		4 1.0% .2%	4 1.0% .1%		2 .5% .1%	23 5.9% 1.9%	1 .3% .0%		4 1.0% .8%	389
S			3 10.3% .2%	1 3.4% .0%			25 86.2% 2.1%				29
T	175 49.3% 7.9%		10 2.8% .5%	24 6.8% .5%	2 .6% .1%	12 3.4% .7%	1 .3% .1%		20 5.6% 2.0%		355
V	41 4.8% 1.9%	1 .1% .8%	3 .4% .2%	11 1.3% .2%	6 .7% .2%	30 3.5% 1.8%	643 75.0% 53.3%	25 2.9% 1.2%		4 .5% .8%	857
X	1 .6% .0%		20 12.6% 1.1%	124 78.0% 2.8%	2 1.3% .1%	2 1.3% .1%	2 1.3% .2%	1 .6% .0%	1 .6% .1%		159
1	2 12.5% .1%		1 6.3% .1%	8 50.0% .2%	1 6.3% .0%			1 6.3% .0%	1 6.3% .1%		16
3	10 45.5% .5%		3 13.6% .2%	5 22.7% .1%			1 4.5% .1%		1 4.5% .1%		22
5	3 75.0% .1%		1 25.0% .1%								4
6	38 76.0% 1.7%		1 2.0% .1%	5 10.0% .1%				3 6.0% .1%			50
8	10 76.9% .5%		3 23.1% .2%								13
9								2100.0% .1%			2
TOTAL	2203	131	1851	4423	2511	1656	1207	2052	1016	480	59115

TABLE A.3

TRANSLATION TABLE BETWEEN LIBRARY OF CONGRESS CLASSIFICATION AND DEWEY DECIMAL CLASSIFICATION

DDC / LC	000	100	200	300	400	500	600	700	800	900	FIC	TOTAL TITLES	PERCENT-AGE OF TOTAL
A	117 .4255	8 .0291	3 .0109	55 .2000	4 .0145	50 .1818	15 .0545	5 .0182	8 .0291	10 .0364	0 0	275	0.47%
B	12 .0031	1209 .3098	2484 .6366	113 .0290	5 .0013	3 .0008	19 .0049	14 .0036	14 .0036	29 .0074	0 0	3902	6.60%
C	24 .0287	4 .0048	10 .0119	30 .0358	5 .0068	2 .0024	9 .0108	63 .0753	5 .0060	685 .8184	0 0	837	1.42%
D	14 .0031	1 .0002	16 .0035	892 .1951	14 .0031	8 .0017	13 .0028	53 .0116	12 .0026	3549 .7762	0 0	4572	7.73%
E	14 .0079	3 .0017	33 .0187	744 .4211	5 .0028	4 .0023	7 .0040	18 .0102	10 .0057	929 .5257	0 0	1767	2.99%
F	5 .0036	1 .0007	8 .0057	225 .1606	1 .0007	3 .0021	7 .0050	15 .0107	3 .0021	1133 .8087	0 0	1401	2.37%
G	0 0	10 .0055	7 .0038	328 .1789	1 .0005	237 .1293	84 .0458	730 .3983	7 .0038	429 .2340	0 0	1833	3.10%
H	20 .0023	70 .0082	37 .0043	6943 .8138	0 0	53 .0062	1180 .1383	177 .0207	8 .0009	44 .0052	0 0	8532	14.43%
J	10 .0056	5 .0028	1 .0006	1721 .9631	3 .0017	2 .0011	21 .0118	4 .0022	0 0	20 .0112	0 0	1787	3.02%
K	15 .0084	3 .0017	0 0	1637 .9150	1 .0006	7 .0039	109 .0609	4 .0022	1 .0006	12 .0067	0 0	1789	3.03%
L	29 .0089	36 .0110	17 .0052	3044 .9343	40 .0123	6 .0018	50 .0153	8 .0025	21 .0064	7 .0021	0 0	3258	5.51%
M	13 .0184	2 .0028	1 .0014	29 .0410	0 0	0 0	11 .0155	643 .9082	8 .0113	1 .0014	0 0	708	1.20%
N	7 .0038	0 0	3 .0016	18 .0097	0 0	0 0	9 .0048	1799 .9656	9 .0048	18 .0097	0 0	1863	3.15%
P	223 .0222	22 .0022	27 .0027	261 .0260	648 .0645	170 .0169	70 .0070	474 .0472	4314 .4293	73 .0073	3766 .3748	10048	17.00%
Q	63 .0109	45 .0078	2 .0003	164 .0284	5 .0009	4875 .8444	581 .1006	19 .0033	5 .0009	14 .0024	0 0	5773	9.77%
R	8 .0037	39 .0179	5 .0023	234 .1072	1 .0005	24 .0110	1855 .8501	9 .0041	2 .0009	5 .0023	0 0	2182	3.69%
S	11 .0073	0 0	1 .0007	195 .1299	0 0	89 .0593	990 .6596	194 .1292	5 .0033	16 .0107	0 0	1501	2.54%
T	45 .0099	4 .0009	0 0	331 .0727	2 .0004	356 .0782	3490 .7662	299 .0656	8 .0018	20 .0044	0 0	4555	7.71%
U	0 0	1 .0021	0 0	389 .8087	1 .0021	6 .0125	58 .1206	13 .0270	0 0	13 .0270	0 0	481	0.81%
V	1 .0032	0 0	0 0	138 .4409	0 0	13 .0415	144 .4601	3 .0096	1 .0032	13 .0415	0 0	313	0.53%
Z	1444 .8328	3 .0017	3 .0017	38 .0219	3 .0017	26 .0150	163 .0940	21 .0121	16 .0092	17 .0098	0 0	1734	2.93%
TOTAL %	2075 3.51%	1466 2.48%	2658 4.50%	17,529 29.65%	739 1.25%	5934 10.04%	8885 15.03%	4566 7.73%	4456 7.54%	7037 11.90%	3766 6.37%	59,111	100.00%

FIGURE A.1

TRANSLATION PROGRAM -- ASCII to EBCDIC

```
                                                                                               PAGE    1
  LCC  OBJECT CODE      ADDR1 ADDR2  STMT   SOURCE STATEMENT                          F01FEB69   8/06/70

000000                                 1           START                                         03020SLA
                                       2           SAVE  (14,12)        NEED THESE FOR LATER RETURN TO SYSTEM  03022SLA
000000                                 3+          DS    0H
000000 90EC 000C              0000C    4+          STM   14,12,12(13) SAVE REGISTERS
000004 0530                            5           BALR  3,0                                     03030SLA
000006                                 6           USING *,3                                     03040SLA
000006 50D0 38DE              008E4    7                 ST   13,SAVE13                          03019SLA
00000A 47F0 300A              00010    8           B     BEGIN3                                  03050SLA
                                       9 *         *                                             03060SLA
                                      10 *         *          THIS PROGRAM TRANSLATES THE MARC INFO   03070SLA
                                      11 *         *           FROM ASCII TO EBDIC.              03080SLA
                                      12 *         *            WRITTEN DEC. 1968. BY JMW. WASH. ST. LIB.   03090SLA
                                      13 *         *                                             03100SLA
                                      14 *         *                                             03110SLA
                                      15 BEGIN3    OPEN  INDCB                                   03120SLA
00000E 0700                           16+          CNOP  0,4
000010 4510 3012              00018   17+BEGIN3    BAL   1,*+8 LOAD REG1 W/LIST ADDR.
000014 80                             18+          DC    AL1(128) OPTION BYTE
000015 000AF0                         19+          DC    AL3(INDCB) DCB ADDRESS
000018 0A13                           20+          SVC   19 ISSUE OPEN SVC
                                      21           OPEN  (OUTDCB,OUTPUT)                         03122SLA
00001A 0700                           22+          CNOP  0,4
00001C 4510 301E              00024   23+          BAL   1,*+8 LOAD REG1 W/LIST ADDR.
000020 8F                             24+          DC    AL1(143) OPTION BYTE
000021 000B50                         25+          DC    AL3(OUTDCB) DCB ADDRESS
000024 0A13                           26+          SVC   19 ISSUE OPEN SVC
                                      27 *         *                                             03130SLA
                                      28 *         *          FIRST IT IS NECESSARY TO FIND THE END OF RECORD   03140SLA
                                      29 A3160     GET   INDCB,MRCREC                            03160SLA
000026 4110 3AEA              00AF0   30+A3160     LA    1,INDCB LOAD PARAMETER REG 1
00002A 4100 30CE              000D4   31+          LA    0,MRCREC LOAD PARAMETER REG 0
00002E 58F0 1030              00030   32+          L     15,48(0,1) LOAD GET ROUTINE ADDR.
000032 05EF                           33+          BALR  14,15 LINK TO GET ROUTINE
000034 1BBB                           34           SR    11,11                                   03162SLA
000036 5AB0 38DA              008E0   35           A     11,EIGHT          STORE FOR LATER CHECKING   03164SLA
00003A D204 38CF 30CE 008D5 000D4     36           MVC   HOLD,MLNGTH       MOVE LENGTH INDICATOR FIELD   03170SLA
000040 DC04 38CF 39E2 008D5 009E8     37           TR    HOLD,TABLE2       TRANSLATE             03180SLA
000046 F274 3AE2 38CF 00AE8 008D5     38           PACK  PACKED,HOLD                             03190SLA
00004C 4F70 3AE2              00AE8   39           CVB   7,PACKED          LENGTH OF RECORD NOW IN REG 7   03200SLA
000050 1BCC                           40           SR    12,12             CLEAR 12 FOR # TIMES THRU TRANSLATE   03202SLA
000052 4150 3B4A              00B50   41           LA    5,OUTDCB                                04112SLA
000000                                42           USING IHADCB,5                                04113SLA
000056 4070 5052              00052   43           STH   7,DCBLRECL        NEED TO GET LENGTH IN DCB RECORD   04115SLA
                                      44 *         *                                             04120SLA
                                      45 *         *                       HAVE FOUND LENGTH, NOW NEED TO TRANS 04130SLA
                                      46 *         *                                             04140SLA
00005A 1B99                           47           SR    9,9               CLEAR 9               04150SLA
00005C 4190 0100              00100   48           LA    9,256(0)          PUT 256 IN 9          04160SLA
000060 47F0 305E              00064   49           B     A4190                                   04170SLA
                                      50 *         *                                             04180SLA
000064 41A0 30CE              000D4   51 A4190     LA    10,MRCREC         PUT ADDRESS OF MRCREC IN REG 10   04190SLA
000068 1887                           52 A4200     LR    8,7               PUT TOTAL LENGTH IN 8   04200SLA
00006A 1879                           53           SR    7,9               SUBTRACT 256 FROM 7   04210SLA
00006C 47C0 308A              00090   54           BC    12,A5070     IF 0 OR LESS, USE THE REMAINDER   04220SLA
000070 47F0 306E              00074   55           B     A5000             OTHERWISE, TRANSLATE 256 POSITIONS   04222SLA
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FIGURE A.1, cont.

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                                                                                                   PAGE    2

  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                      F01FEB69   8/06/70

000074 DCFF A000 39E2 00000 009E8    56 A5000     TR    0(256,10),TABLE2     TRANSLATE 256 POS OF MRCREC          05000SLA
00007A 41AA 0100              00100  57           LA    10,256(10)           INCREMENT REG 10 BY 256              05010SLA
00007E 5AC0 38D6              008DC  58           A     12,ONE                                                    05011SLA
000082 15BC                          59           CLR   11,12                COMPARE # OF TIMES THRU WITH MAXIMUM 05012SLA
000084 4780 3098              0009E  60           BC    8,OUTPUT             WRITE THE RECORD IF LOOPED 8 TIMES   05014SLA
000088 47C0 30AA              000BC  61           BC    12,ERROR             IF SOMEHOW HIGHER, HAVE TROUBLE      05016SLA
00008C 47F0 3062              00068  62           B     A4200                GO BACK TO LOOP                      05020SLA
                                     63 *         *                                                               05030SLA
                                     64 *         *                          DO THIS IF REMAINDER IN REG 7 IS     05040SLA
                                     65 *         *                           256 OR FEWER CHARACTERS             05050SLA
                                     66 *         *                                                               05060SLA
000090 5B80 38D6              008DC  67 A5070     S     8,ONE                NEED ONE LESS THAN ACTUAL LENGTH     05070SLA
000094 4280 3093              00099  68           STC   8,A5080+1            INSERT LENGTH IN INSTRUCTION         05080SLA
000098 DC00 A000 39E2 00000 009E8    69 A5080     TR    0(0,10),TABLE2                                            05090SLA
                                     70 *         *                                                               05100SLA
                                     71 *         *                          FINISHED TRANSLATE WRITE AND LOOP    05110SLA
                                     72 OUTPUT    PUT   OUTDCB,MRCREC                                             05120SLA
00009E 4110 384A              00B50  73+OUTPUT    LA    1,OUTDCB LOAD PARAMETER REG 1
0000A2 4100 30CE              000D4  74+          LA    0,MRCREC LOAD PARAMETER REG 0
0000A6 58F0 1030              00030  75+          L     15,48(0,1) LOAD PUT ROUTINE ADDR.
0000AA 05EF                          76+          BALR  14,15 LINK TO PUT ROUTINE
0000AC 47F0 3020              00026  77           B     A3160                GO GET NEW RECORD                    05130SLA
0000B0 47F0 3020              00026  78 ERROR     B     A3160                                                     05150SLA
                                     79 ENDJOB    CLOSE INDCB                                                     05170SLA
0000B4                               80+          CNOP  0,4
0000B4 4510 30B6              000BC  81+ENDJOB    BAL   1,*+8 BRANCH AROUND LIST
0000B8 80                            82+          DC    AL1(128) OPTION BYTE
0000B9 000AF0                        83+          DC    AL3(INDCB) DCB ADDRESS
0000BC 0A14                          84+          SVC   20 ISSUE CLOSE SVC
                                     85           CLOSE OUTDCB                                                    05172SLA
0000BE 0700                          86+          CNOP  0,4
0000C0 4510 30C2              000C8  87+          BAL   1,*+8 BRANCH AROUND LIST
0000C4 80                            88+          DC    AL1(128) OPTION BYTE
0000C5 000B50                        89+          DC    AL3(OUTDCB) DCB ADDRESS
0000C8 0A14                          90+          SVC   20 ISSUE CLOSE SVC
0000CA 58D0 38DE              008E4  91                 L     13,SAVE13 RESOTRE REG13.                            05178SLA
                                     92           RETURN (14,12)       EOJ-RETURN CONTROL TO SUPERVISOR           05180SLA
0000CE 98EC D00C              0000C  93+          LM    14,12,12(13) RESTORE THE REGISTERS
0000D2 07FE                          94+          BR    14 RETURN
                                     95 *         *                                                               05190SLA
                                     96 *         *                                                               05200SLA
0000D4                               97 MRCREC    DS    0CL2048              TOTAL INPUT-OUTPUT AREA              06000SLA
0000D4                               98 MLNGTH    DS    CL5                  LENGTH SEGMENT                       06002SLA
0000D9                               99           DS    CL2043                                                    06004SLA
0008D4 1D                           100           DC    X'1D'                                                     06006SLA
0008D5                              101 HOLD      DS    CL5                                                       06008SLA
0008DA 0000
0008DC 00000001                     102 ONE       DC    F'1'                 SUBTRACT FROM REGISTER WITH THIS     06050SLA
0008E0 00000008                     103 EIGHT     DC    F'8'                 MAXIMUM NUMBER OF TIMES TO TRANSLATE 06051SLA
0008E4                              104 SAVE13    DS    F               AREA TO STORE REGISTER 13                 06052SLA
                                    105 *         *                                                               06060SLA
0008E8 0000000000000000             106 TRTTABLE  DC    27X'00'                                                   06070SLA
000903 1111                         107           DC    2X'11'                                                    06080SLA
000905 0000000000000000             108           DC    227X'00'                                                  06090SLA
                                    109 *         *                                                               06100SLA
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FIGURE A.1, cont.

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                                                                                                 PAGE    3

  LCC  OBJECT CODE     ADDR1 ADDR2  STMT    SOURCE STATEMENT                              F01FEB69   8/06/70

0009E8 0000000000000000               110 TABLE2    DC      19X'00'                                 06110SLA
0009FB 13                             111           DC      X'13'        THIS IS TAPE MARK          06120SLA
0009FC 0000000000000000               112           DC      8X'00'                                  06130SLA
000A04 1C                             113           DC      X'1C'        EOF                        06140SLA
000A05 1D                             114           DC      X'1D'        EOR                        06150SLA
000A06 1E                             115           DC      X'1E'        FIELD TERMINATOR           06160SLA
000A07 1F                             116           DC      X'1F'        DELIMETER                  06170SLA
000A08 40                             117           DC       C' '                                   06180SLA
000A09 4B                             118           DC      C'.'                                    06190SLA
000A0A 7D                             119           DC      C''''                                   06200SLA
000A0B 7B                             120           DC      C'#'                                    06210SLA
000A0C 5B                             121           DC      C'$'                                    06220SLA
000A0D 40                             122           DC      C' '                                    06230SLA
000A0E 50                             123           DC      C'&&'                                   07000SLA
000A0F 7D                             124           DC      C''''                                   07010SLA
000A10 4D                             125           DC      C'('                                    07020SLA
000A11 5D                             126           DC      C')'                                    07030SLA
000A12 5C                             127           DC      C'*'                                    07040SLA
000A13 4E                             128           DC      C'+'                                    07050SLA
000A14 6B                             129           DC      C','                                    07060SLA
000A15 60                             130           DC      C'-'                                    07070SLA
000A16 4B                             131           DC      C'.'                                    07080SLA
000A17 61                             132           DC      C'/'                                    07090SLA
000A18 F0                             133           DC      C'0'                                    07100SLA
000A19 F1                             134           DC      C'1'                                    07110SLA
000A1A F2                             135           DC      C'2'                                    07120SLA
000A1B F3                             136           DC      C'3'                                    07130SLA
000A1C F4                             137           DC      C'4'                                    07140SLA
000A1D F5                             138           DC      C'5'                                    07150SLA
000A1E F6                             139           DC      C'6'                                    07160SLA
000A1F F7                             140           DC      C'7'                                    07170SLA
000A20 F8                             141           DC      C'8'                                    07180SLA
000A21 F9                             142           DC      C'9'                                    07190SLA
000A22 6B                             143           DC      C','         SUBSTITUTE COMMA FOR COLON 07200SLA
000A23 6B                             144           DC      C','     SUBSTITUTE COMMA FOR SEMICOLON 07210SLA
000A24 40                             145           DC      C' '                                    07220SLA
000A25 7E                             146           DC      C'='                                    07230SLA
000A26 40                             147           DC      C' '                                    08000SLA
000A27 4B                             148           DC      C'.'     SUBSTITUTE PERIOD  FOR QUESTION 08010SLA
000A28 7C                             149           DC      C'@'                                    08020SLA
000A29 C1                             150           DC      C'A'                                    08030SLA
000A2A C2                             151           DC      C'B'                                    08040SLA
000A2B C3                             152           DC      C'C'                                    08050SLA
000A2C C4                             153           DC      C'D'                                    08060SLA
000A2D C5                             154           DC      C'E'                                    08070SLA
000A2E C6                             155           DC      C'F'                                    08080SLA
000A2F C7                             156           DC      C'G'                                    08090SLA
000A30 C8                             157           DC      C'H'                                    08100SLA
000A31 C9                             158           DC      C'I'                                    08110SLA
000A32 D1                             159           DC      C'J'                                    08120SLA
000A33 D2                             160           DC      C'K'                                    08130SLA
000A34 D3                             161           DC      C'L'                                    08140SLA
000A35 D4                             162           DC      C'M'                                    08150SLA
000A36 D5                             163           DC      C'N'                                    08160SLA
000A37 D6                             164           DC      C'O'                                    08170SLA
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FIGURE A.1, cont.

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                                                                                                  PAGE    4

  LOC  OBJECT CODE      ADDR1 ADDR2  STMT   SOURCE  STATEMENT                                       F01FEB69   8/06/70

000A38 D7                             165          DC     C'P'                                                08180SLA
000A39 D8                             166          DC     C'Q'                                                08190SLA
000A3A D9                             167          DC     C'R'                                                08200SLA
000A3B E2                             168          DC     C'S'                                                08210SLA
000A3C E3                             169          DC     C'T'                                                08220SLA
000A3D E4                             170          DC     C'U'                                                08230SLA
000A3E E5                             171          DC     C'V'                                                09000SLA
000A3F E6                             172          DC     C'W'                                                09010SLA
000A40 E7                             173          DC     C'X'                                                09020SLA
000A41 E8                             174          DC     C'Y'                                                09030SLA
000A42 E9                             175          DC          C'Z'                                           09040SLA
000A43 61                             176          DC          C'/'          SUBSTITUTE SLASH FOR OPEN BRACKETS   09050SLA
000A44 40                             177          DC          C' '                                           09060SLA
000A45 61                             178          DC          C'/'          SUBSTITUTE SLASH FOR CLOSE BRACKETS  09070SLA
000A46 404040                         179          DC          3C' '                                          09080SLA
000A49 C1                             180          DC          C'A'                                           09090SLA
000A4A C2                             181          DC          C'B'                                           09100SLA
000A4B C3                             182          DC          C'C'                                           09110SLA
000A4C C4                             183          DC          C'D'                                           09120SLA
000A4D C5                             184          DC          C'E'                                           09130SLA
000A4E C6                             185          DC          C'F'                                           09140SLA
000A4F C7                             186          DC          C'G'                                           09150SLA
000A50 C8                             187          DC          C'H'                                           09160SLA
000A51 C9                             188          DC          C'I'                                           09170SLA
000A52 D1                             189          DC          C'J'                                           09180SLA
000A53 D2                             190          DC          C'K'                                           09190SLA
000A54 D3                             191          DC          C'L'                                           09200SLA
000A55 D4                             192          DC          C'M'                                           09210SLA
000A56 D5                             193          DC          C'N'                                           09220SLA
000A57 D6                             194          DC          C'O'                                           09230SLA
000A58 D7                             195          DC     C'P'                                                10000SLA
000A59 D8                             196          DC     C'Q'                                                10010SLA
000A5A D9                             197          DC     C'R'                                                10020SLA
000A5B E2                             198          DC     C'S'                                                10030SLA
000A5C E3                             199          DC     C'T'                                                10040SLA
000A5D E4                             200          DC     C'U'                                                10050SLA
000A5E E5                             201          DC     C'V'                                                10060SLA
000A5F E6                             202          DC     C'W'                                                10070SLA
000A60 E7                             203          DC     C'X'                                                10080SLA
000A61 E8                             204          DC     C'Y'                                                10090SLA
000A62 E9                             205          DC     C'Z'                                                10100SLA
000A63 4040404040404040               206          DC     133C' '                                             10100SLA
000AE8                                207 PACKED   DS     D                     AREA FOR PACKING              10102SLA
                                      208 INDCB    DCB    DDNAME=INDD,DSORG=PS,RECFM=U,EROPT=SKP,EODAD=ENDJOB,   X10120SLA
                                                          MACRF=GM                                            10122SLA

                                      210+*                              DATA CONTROL BLOCK
                                      211+*
000AF0                                212+         ORG    *-0 TO ELIMINATE UNUSED SPACE
000AF0                                213+INDCB    DS     OF ORIGIN ON WORD BOUNDRY
000AF0                                214+         ORG    *+0 TO ORIGIN GENERATION

                                      216+*                              DIRECT ACCESS DEVICE INTERFACE
```

FIGURE A.1, cont.

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                                                                                                        PAGE    5

  LOC  OBJECT CODE     ADDR1 ADDR2  STMT    SOURCE STATEMENT                                      F01FEB69   8/06/70

000AF0 0000000000000000             218+          DC    BL16'0' FDAD,DVTBL
000B00 00000000                     219+          DC    A(0) KEYLE,DEVT,TRBAL

                                    221+*                        COMMON ACCESS METHOD INTERFACE

000B04 00                           223+          DC    AL1(0) BUFNO
000B05 000001                       224+          DC    AL3(1) BUFCB
000B08 0000                         225+          DC    AL2(0) BUFL
000B0A 4000                         226+          DC    BL2'0100000000000000' DSORG
000B0C 00000001                     227+          DC    A(1) IOBAD

                                    229+*                        FOUNDATION EXTENSION

000B10 00                           231+          DC    BL1'00000000' BFTEK,BFALN,HIARCHY
000B11 000084                       232+          DC    AL3(ENDJOB) EODAD
000B14 C0                           233+          DC    BL1'11000000' RECFM
000B15 000000                       234+          DC    AL3(0) EXLST

                                    236+*                        FOUNDATION BLOCK

000B18 C9D5C4C440404040             238+          DC    CL8'INDD' DDNAME
000B20 02                           239+          DC    BL1'00000010' OFLGS
000B21 00                           240+          DC    BL1'00000000' IFLG
000B22 5000                         241+          DC    BL2'0101000000000000' MACR

                                    243+*                        BSAM-BPAM-QSAM INTERFACE

000B24 00                           245+          DC    BL1'00000000' RER1
000B25 000001                       246+          DC    AL3(1) CHECK, GERR, PERR
000B28 00000001                     247+          DC    A(1) SYNAD
000B2C 0000                         248+          DC    H'0' CIND1, CIND2
000B2E 0000                         249+          DC    AL2(0) BLKSIZE
000B30 00000000                     250+          DC    F'0' WCPO, WCPL, OFFSR, OFFSW
000B34 00000001                     251+          DC    A(1) IOBA
000B38 00                           252+          DC    AL1(0) NCP
000B39 000001                       253+          DC    AL3(1) EOBR, EOBAD

                                    255+*                        QSAM INTERFACE

000B3C 00000001                     257+          DC    A(1) RECAD
000B40 0000                         258+          DC    H'0' QSWS
000B42 0000                         259+          DC    AL2(0) LRECL
000B44 40                           260+          DC    BL1'01000000' EROPT
000B45 000001                       261+          DC    AL3(1) CNTRL
000B48 00000000                     262+          DC    F'0' PRECL
000B4C 00000001                     263+          DC    A(1) EOB
                                    264 *         *                                                         10140SLA
                                    265 OUTDCB    DCB   DDNAME=OUTDD,DSORG=PS,RECFM=U,EROPT=ABE,MACRF=PM    10150SLA

                                    267+*                        DATA CONTROL BLOCK
                                    268+*
000B50                              269+          ORG   *-0 TO ELIMINATE UNUSED SPACE
000B50                              270+OUTDCB    DS    0F ORIGIN ON WORD BOUNDRY
000B50                              271+          ORG   *+0 TO ORIGIN GENERATION
```

FIGURE A.1, cont.

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                                                                                          PAGE    6

  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                       F01FEB69   8/06/70
                                    273+*                    DIRECT ACCESS DEVICE INTERFACE

000B50 0000000000000000             275+          DC    BL16'0' FDAD,DVTBL
000B60 00000000                     276+          DC    A(0) KEYLE,DEVT,TRBAL
                                    278+*                    COMMON ACCESS METHOD INTERFACE

000B64 00                           280+          DC    AL1(0) BUFNO
000B65 000001                       281+          DC    AL3(1) BUFCB
000B68 0000                         282+          DC    AL2(0) BUFL
000B6A 4000                         283+          DC    BL2'0100000000000000' DSORG
000B6C 00000001                     284+          DC    A(1) IOBAD

                                    286+*                    FOUNDATION EXTENSION

000B70 00                           288+          DC    BL1'00000000' BFTEK,BFALN,HIARCHY
000B71 000001                       289+          DC    AL3(1) EODAD
000B74 C0                           290+          DC    BL1'11000000' RECFM
000B75 000000                       291+          DC    AL3(0) EXLST
                                    293+*                    FOUNDATION BLOCK

000B78 D6E4E3C4C4404040             295+          DC    CL8'OUTDD' DDNAME
000B80 02                           296+          DC    BL1'00000010' OFLGS
000B81 00                           297+          DC    BL1'00000000' IFLG
000B82 0050                         298+          DC    BL2'0000000001010000' MACR

                                    300+*                    BSAM-BPAM-QSAM INTERFACE

000B84 00                           302+          DC    BL1'00000000' RER1
000B85 000001                       303+          DC    AL3(1) CHECK, GERR, PERR
000B88 00000001                     304+          DC    A(1) SYNAD
000B8C 0000                         305+          DC    H'0' CIND1, CIND2
000B8E 0000                         306+          DC    AL2(0) BLKSIZE
000B90 00000000                     307+          DC    F'0' WCPO, WCPL, OFFSR, OFFSW
000B94 00000001                     308+          DC    A(1) IOBA
000B98 00                           309+          DC    AL1(0) NCP
000B99 000001                       310+          DC    AL3(1) EOBR, EOBAD

                                    312+*                          QSAM INTERFACE

000B9C 00000001                     314+          DC    A(1) RECAD
000BA0 0000                         315+          DC    H'0' QSWS
000BA2 0000                         316+          DC    AL2(0) LRECL
000BA4 20                           317+          DC    BL1'00100000' EROPT
000BA5 000001                       318+          DC    AL3(1) CNTRL
000BA8 00000000                     319+          DC    F'0' PRECL
000BAC 00000001                     320+          DC    A(1) EOB
                                    321           DCBD  DSORG=PS,DEVD=DA                              10152SLA

                                    323+*                    DCB SYMBOLIC DEFINITION FOR
                                    324+*                    PHYSICAL SEQUENTIAL

000000                              326+IHADCB    DSECT
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FIGURE A.1, cont.

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                                                                                          PAGE    7

 LCC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE  STATEMENT                                  F01FEB69   8/06/70
                                   328+*                         DEVICE INTERFACES

                                   330+*                      DIRECT ACCESS DEVICES

000000                             332+DCBRELAD DS    A
000004                             333+DCBKEYCN DS    AL1
000005                             334+DCBFDAD  DS    CL8
00000C                             335+         ORG   *-1
00000C                             336+DCBDVTBL DS    A
000010                             337+         DS    H
000012                             338+DCBTRBAL DS    AL2
                                   339+*                         ACCESS METHOD COMMON INTERFACE

000010                             341+         ORG   IHADCB+16
000010                             342+DCBKEYLE DS    BL1
000011                             343+DCBDEVT  DS    0BL1
000011                             344+DCBREL   DS    AL3
000014                             345+DCBBUFNO DS    0BL1
000014                             346+DCBBUFCB DS    A
000018                             347+DCBBUFL  DS    H
00001A                             348+DCBDSORG DS    BL2
00001C                             349+DCBIOBAD DS    A

                                   351+*                         FOUNDATION EXTENSION

000020                             353+DCBBFTEK DS    0BL1
000020                             354+DCBBFALN DS    0BL1
000020                             355+DCBEODAD DS    A
000024                             356+DCBRECFM DS    0BL1
000024                             357+DCBEXLST DS    A


                                   360+*                         FOUNDATION BEFORE OPEN

000028                             362+         ORG   IHADCB+40
000028                             363+DCBDDNAM DS    CL8
000030                             364+DCBOFLGS DS    BL1
000031                             365+DCBIFLG  DS    BL1
000032                             366+DCBMACR  DS    BL2

                                   368+*                         FOUNDATION AFTER OPEN

000028                             370+         ORG   IHADCB+40
000028                             371+DCBTIOT  DS    BL2
00002A                             372+DCBMACRF DS    BL2
00002C                             373+DCBIFLGS DS    0BL1
00002C                             374+DCBDEBAD DS    A
000030                             375+DCBREAD  DS    0A
000030                             376+DCBWRITE DS    0A
000030                             377+DCBGET   DS    0A
000030                             378+DCBPUT   DS    0A

                                   380+*                         QSAM-BSAM-BPAM COMMON INTERFACE

000034                             382+         ORG   IHADCB+52
```

FIGURE A.1, cont.

```
                                                                                          PAGE    8

  LOC  OBJECT CODE    ADDR1 ADDR2  STMT    SOURCE  STATEMENT                     F01FEB69    8/06/70

000034                             383+DCBOPTCD  DS    0BL1
000034                             384+DCBGERR   DS    0A
000034                             385+DCBPERR   DS    0A
000034                             386+DCBCHECK  DS    A
000038                             387+          ORG   IHADCB+56
000038                             388+DCBIOBL   DS    0BL1
000038                             389+DCBSYNAD  DS    A
00003C                             390+          ORG   IHADCB+60
00003C                             391+DCBCIND1  DS    BL1
00003D                             392+DCBCIND2  DS    BL1
00003E                             393+DCBBLKSI  DS    H
000040                             394+          ORG   IHADCB+64
000040                             395+DCBWCPO   DS    BL1
000041                             396+DCBWCPL   DS    BL1
000042                             397+DCBOFFSR  DS    BL1
000043                             398+DCBOFFSW  DS    BL1
000044                             399+DCBIOBA   DS    A

                                   401+*                        BSAM-BPAM INTERFACE

000048                             403+DCBNCP    DS    0BL1
000048                             404+DCBEOBR   DS    A
00004C                             405+DCBEOBW   DS    A
000050                             406+DCBDIRCT  DS    H
000052                             407+DCBLRECL  DS    H
000054                             408+          ORG   IHADCB+84
000054                             409+DCBCNTRL  DS    0A
000054                             410+DCBNOTE   DS    0A
000054                             411+DCBPOINT  DS    A

                                   413+*                        QSAM INTERFACE

000048                             415+          ORG   IHADCB+72
000048                             416+DCBLCCW   DS    0A
000048                             417+DCBEOBAD  DS    A
00004C                             418+DCBCCCW   DS    0A
00004C                             419+DCBRECAD  DS    A
000050                             420+DCBQSWS   DS    AL2
000054                             421+          ORG   IHADCB+84
000054                             422+DCBEROPT  DS    0BL1
00005A                             423+          ORG   IHADCB+90
00005A                             424+DCBPRECL  DS    AL2
00005C                             425+DCBEOB    DS    A

                                   427           END                                          10190SLA
```

CORRELATION TABLE PROGRAM -- ANALYSIS AND FORMAT
FIGURE A.2

```
LEVEL 1JAN67                              COBOL F                                   DATE AUG  7,1970

   1

001010 IDENTIFICATION DIVISION.                                                VEGP0106
001020 PROGRAM-ID.     'P0106385'.                                             VEGP0106
001030 AUTHOR.          VIVIENNE GROUT.                                        VEGP0106
001040 INSTALLATION.    WSDPSC.                                                VEGP0106
001050 DATE-WRITTEN.    JULY 1970.                                             VEGP0106
001060 DATE-COMPILED. AUG  7,1970                                              VEGP0106
001070 REMARKS.                                                                VEGP0106
001130 ENVIRONMENT DIVISION.                                                   VEGP0106
001140 CONFIGURATION SECTION.                                                  VEGP0106
001150 SOURCE-COMPUTER.     IBM-360 I50.                                       VEGP0106
001160 OBJECT-COMPUTER.     IBM-360 I50.                                       VEGP0106
001170 INPUT-OUTPUT SECTION.                                                   VEGP0106
001180 FILE-CONTROL.                                                           VEGP0106
001190     SELECT BASE-MSTR    ASSIGN TO 'INTAPE'  UTILITY.                    VEGP0106
001200     SELECT CTL-CARD     ASSIGN TO 'INCTL'   UTILITY.                    VEGP0106
001205     SELECT R0           ASSIGN TO 'RPT0'    UTILITY.                    VEGP0106
001210     SELECT R1           ASSIGN TO 'RPT1'    UTILITY.                    VEGP0106
001220     SELECT R2           ASSIGN TO 'RPT2'    UTILITY.                    VEGP0106
001230     SELECT R3           ASSIGN TO 'RPT3'    UTILITY.                    VEGP0106
001240     SELECT R4           ASSIGN TO 'RPT4'    UTILITY.                    VEGP0106
001250     SELECT R5           ASSIGN TO 'RPT5'    UTILITY.                    VEGP0106
001260     SELECT R6           ASSIGN TO 'RPT6'    UTILITY.                    VEGP0106
001270     SELECT R7           ASSIGN TO 'RPT7'    UTILITY.                    VEGP0106
001280     SELECT R8           ASSIGN TO 'RPT8'    UTILITY.                    VEGP0106
001290     SELECT R9           ASSIGN TO 'RPT9'    UTILITY.                    VEGP0106
001300     SELECT R10          ASSIGN TO 'RPT10'   UTILITY.                    VEGP0106
001310     SELECT R11          ASSIGN TO 'RPT11'   UTILITY.                    VEGP0106
001320 DATA DIVISION.                                                          VEGP0106
001330 FILE SECTION.                                                           VEGP0106

002010 FD  BASE-MSTR                                                           VEGP0106
002020     RECORDING MODE IS U                                                 VEGP0106
002030     LABEL RECORDS ARE STANDARD                                          VEGP0106
002040     DATA RECORD IS DATA-BASE.                                           VEGP0106
002050 01  DATA-BASE                                 PICTURE X(2508).          VEGP0106

002100 FD  CTL-CARD                                                            VEGP0106
002110     RECORDING MODE IS F                                                 VEGP0106
002120     RECORD CONTAINS 80 CHARACTERS                                       VEGP0106
002130     BLOCK  CONTAINS  0 RECORDS                                          VEGP0106
002140     LABEL RECORDS ARE OMITTED                                           VEGP0106
002150     DATA RECORD IS CTL-INFO.                                            VEGP0106
002160 01  CTL-INFO.                                                           VEGP0106
002170     05  IDENT-CTL                             PICTURE X(6).             VEGP0106
002180         88  GOOD-CTL    VALUE 'MATRIX'.                                 VEGP0106
002190     05  FILLER                                PICTURE X(14).            VEGP0106
002200     05  TAG1                                  PICTURE 999.              VEGP0106
002210     05  FILLER                                PICTURE XXX.              VEGP0106
002220     05  TAG2                                  PICTURE 999.              VEGP0106
002230     05  FILLER                                PICTURE XXX.              VEGP0106
002240     05  TAG3                                  PICTURE 999.              VEGP0106
003010     05  FILLER                                PICTURE XXX.              VEGP0106
003020     05  TAG4                                  PICTURE 999.              VEGP0106
003030     05  FILLER                                PICTURE XXX.              VEGP0106
```

FIGURE A.2, cont.

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   2

00055   003040      05  TAGS                                 PICTURE 999.          VEGP0106
00056   003050      05  FILLER                               PICTURE X(33).        VEGP0106
00057
00058   003051 FD  R0                                                              VEGP0106
00059   003052      RECORDING MODE IS F                                            VEGP0106
00060   003053      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00061   003054      BLOCK  CONTAINS   0 RECORDS                                    VEGP0106
00062   003055      LABEL  RECORDS ARE STANDARD                                    VEGP0106
00063   003056      DATA RECORD IS PRT0.                                           VEGP0106
00064   003057 01  PRT0                                      PICTURE X(133).       VEGP0106
00065
00066   003060 FD  R1                                                              VEGP0106
00067   003070      RECORDING MODE IS F                                            VEGP0106
00068   003080      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00069   003090      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00070   003100      LABEL RECORDS ARE STANDARD                                     VEGP0106
00071   003110      DATA RECORD IS PRT1.                                           VEGP0106
00072   003120 01  PRT1                                      PICTURE X(133).       VEGP0106
00073   003130 FD  R2                                                              VEGP0106
00074   003140      RECORDING MODE IS F                                            VEGP0106
00075   003150      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00076   003160      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00077   003170      LABEL RECORDS ARE STANDARD                                     VEGP0106
00078   003180      DATA RECORD IS PRT2.                                           VEGP0106
00079   003190 01  PRT2                                      PICTURE X(133).       VEGP0106
00080   004010 FD  R3                                                              VEGP0106
00081   004020      RECORDING MODE IS F                                            VEGP0106
00082   004030      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00083   004040      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00084   004050      LABEL RECORDS ARE STANDARD                                     VEGP0106
00085   004060      DATA RECORD IS PRT3.                                           VEGP0106
00086   004070 01  PRT3                                      PICTURE X(133).       VEGP0106
00087   004080 FD  R4                                                              VEGP0106
00088   004090      RECORDING MODE IS F                                            VEGP0106
00089   004100      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00090   004110      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00091   004120      LABEL RECORDS ARE STANDARD                                     VEGP0106
00092   004130      DATA RECORD IS PRT4.                                           VEGP0106
00093   004140 01  PRT4                                      PICTURE X(133).       VEGP0106
00094   004150 FD  R5                                                              VEGP0106
00095   004160      RECORDING MODE IS F                                            VEGP0106
00096   004170      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00097   004180      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00098   004190      LABEL RECORDS ARE STANDARD                                     VEGP0106
00099   004200      DATA RECORD IS PRT5.                                           VEGP0106
00100   004210 01  PRT5                                      PICTURE X(133).       VEGP0106
00101   005010 FD  R6                                                              VEGP0106
00102   005020      RECORDING MODE IS F                                            VEGP0106
00103   005030      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00104   005040      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
00105   005050      LABEL RECORDS ARE STANDARD                                     VEGP0106
00106   005060      DATA RECORD IS PRT6.                                           VEGP0106
00107   005070 01  PRT6                                      PICTURE X(133).       VEGP0106
00108   005080 FD  R7                                                              VEGP0106
00109   005090      RECORDING MODE IS F                                            VEGP0106
00110   005100      RECORD CONTAINS 133 CHARACTERS                                 VEGP0106
00111   005110      BLOCK  CONTAINS 0   RECORDS                                    VEGP0106
```

FIGURE A.2, cont.

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005120       LABEL RECORDS ARE STANDARD                                        VEGP0106
005130       DATA RECORD IS PRT7.                                              VEGP0106
005140 01    PRT7                                      PICTURE X(133).         VEGP0106
005150 FD    R8                                                                VEGP0106
005160       RECORDING MODE IS F                                               VEGP0106
005170       RECORD CONTAINS 133 CHARACTERS                                    VEGP0106
005180       BLOCK  CONTAINS 0   RECORDS                                       VEGP0106
005190       LABEL RECORDS ARE STANDARD                                        VEGP0106
005200       DATA RECORD IS PRT8.                                              VEGP0106
005210 01    PRT8                                      PICTURE X(133).         VEGP0106
006010 FD    R9                                                                VEGP0106
006020       RECORDING MODE IS F                                               VEGP0106
006030       RECORD CONTAINS 133 CHARACTERS                                    VEGP0106
006040       BLOCK  CONTAINS 0   RECORDS                                       VEGP0106
006050       LABEL RECORDS ARE STANDARD                                        VEGP0106
006060       DATA RECORD IS PRT9.                                              VEGP0106
006070 01    PRT9                                      PICTURE X(133).         VEGP0106
006080 FD    R10                                                               VEGP0106
006090       RECORDING MODE IS F                                               VEGP0106
006100       RECORD CONTAINS 133 CHARACTERS                                    VEGP0106
006110       BLOCK  CONTAINS 0   RECORDS                                       VEGP0106
006120       LABEL RECORDS ARE STANDARD                                        VEGP0106
006130       DATA RECORD IS PRT10.                                             VEGP0106
006140 01    PRT10                                     PICTURE X(133).         VEGP0106
006150 FD    R11                                                               VEGP0106
006160       RECORDING MODE IS F                                               VEGP0106
006170       RECORD CONTAINS 133 CHARACTERS                                    VEGP0106
006180       BLOCK  CONTAINS 0   RECORDS                                       VEGP0106
006190       LABEL RECORDS ARE STANDARD                                        VEGP0106
006200       DATA RECORD IS PRT11.                                             VEGP0106
006210 01    PRT11                                     PICTURE X(133).         VEGP0106

007010 SD    SORT-THESE                                                        VEGP0106
007020       RECORDING MODE IS F                                               VEGP0106
007030       DATA RECORD IS REAL-REC.                                          VEGP0106
007040 01    REAL-REC.                                                         VEGP0106
007041       05  PRIME6                                PICTURE X(6).           VEGP0106
007042       05  FILLER                                PICTURE X(12).          VEGP0106

007100 WORKING-STORAGE SECTION.                                                VEGP0106
007110 77  FILLER VALUE 'WORK AREA STARTS HERE'        PICTURE X(21).          VEGP0106
010010 77  DEWEY-SUBS                   COMPUTATIONAL  PICTURE S999.           VEGP0106
010020 77  SAVE-BASE     VALUE 0        COMPUTATIONAL  PICTURE S9(5).          VEGP0106
010030 77  DIREC-BMP     VALUE 0        COMPUTATIONAL  PICTURE S999.           VEGP0106
010040 77  VARI-BMP      VALUE 0        COMPUTATIONAL  PICTURE S9(5).          VEGP0106
010050 77  PULL-BMP      VALUE 0        COMPUTATIONAL  PICTURE S9.             VEGP0106
010060 77  REC-LOC       VALUE 0                       PICTURE 9(5).           VEGP0106
010070 77  TBL-SUBS      VALUE 0        COMPUTATIONAL  PICTURE S999.           VEGP0106
010080 77  SAV-MAJ-LTR                                 PICTURE X.              VEGP0106
010090 77  SAV-GRND-TOT                                PICTURE 9(6).           VEGP0106
010100 77  1ST-REC       VALUE 1                       PICTURE 9.              VEGP0106
010110 77  1ST-MIN       VALUE 1                       PICTURE 9.              VEGP0106
010120 77  RPT10-SWT     VALUE 0                       PICTURE 9.              VEGP0106
010130 77  RPT11-SWT     VALUE 0                       PICTURE 9.              VEGP0106
010140 77  RPT12-SWT     VALUE 0                       PICTURE 9.              VEGP0106
010150 77  RPT13-SWT     VALUE 0                       PICTURE 9.              VEGP0106
010160 77  RPT14-SWT     VALUE 0                       PICTURE 9.              VEGP0106
```

FIGURE A.2, cont.

```
010170 77  RPT15-SWT    VALUE 0                          PICTURE 9.         VEGP0106
010180 77  RPT16-SWT    VALUE 0                          PICTURE 9.         VEGP0106
010190 77  RPT17-SWT    VALUE 0                          PICTURE 9.         VEGP0106
010200 77  RPT18-SWT    VALUE 0                          PICTURE 9.         VEGP0106
010210 77  RPT19-SWT    VALUE 0                          PICTURE 9.         VEGP0106
011010 77  TIME                                          PICTURE 9(8).      VEGP0106
011020 77  JDATE                                         PICTURE 9(5).      VEGP0106
011030 77  PAGECT1           VALUE 0                     PICTURE 999.       VEGP0106
011040 77  PAGECT2           VALUE 0                     PICTURE 999.       VEGP0106
011050 77  PAGECT3           VALUE 0                     PICTURE 999.       VEGP0106
011060 77  PAGECT4           VALUE 0                     PICTURE 999.       VEGP0106
011070 77  PAGECT5           VALUE 0                     PICTURE 999.       VEGP0106
011080 77  PAGECT6           VALUE 0                     PICTURE 999.       VEGP0106
011090 77  PAGECT7           VALUE 0                     PICTURE 999.       VEGP0106
011100 77  PAGECT8           VALUE 0                     PICTURE 999.       VEGP0106
011110 77  PAGECT9           VALUE 0                     PICTURE 999.       VEGP0106
011120 77  PAGECT10          VALUE 0                     PICTURE 999.       VEGP0106
011130 77  FIRST-RETURN      VALUE 1                     PICTURE 9.         VEGP0106
011140 77  TEMP-REC-CT       VALUE 0                     PICTURE 9(5).      VEGP0106
011150 77  PRT-SUBS                   COMPUTATIONAL      PICTURE S99.       VEGP0106
011160 77  OVERALL           VALUE 0                     PICTURE 9(5).      VEGP0106
011170 77  LINE-TOT-SAV                                  PICTURE 9(6).      VEGP0106
011180 77  PCT-RESULT                                    PICTURE 999V9.     VEGP0106
011190 77  BIG-TOT                                       PICTURE 9(5).      VEGP0106
011200 77  TENX              VALUE 0 COMPUTATIONAL       PICTURE S99.       VEGP0106

025010 01  WORK-MAST-A.                                                     VEGP0106
025020         05  LEADER.                                                  VEGP0106
025030             10  TOT-LGTH                          PICTURE 9(5).      VEGP0106
025040             10  FILLER                            PICTURE X(7).      VEGP0106
025050             10  BASE-ADR                          PICTURE 9(5).      VEGP0106
025060             10  FILLER                            PICTURE X(7).      VEGP0106
025070         05  DIRECTORY    OCCURS 207 TIMES.                           VEGP0106
025080             10  TAG                               PICTURE 9(3).      VEGP0106
025090             10  LGTH                              PICTURE 9(4).      VEGP0106
025100             10  DISPL                             PICTURE 9(5).      VEGP0106
025110 01  WORK-MAST-B       REDEFINES WORK-MAST-A.                         VEGP0106
025120         05  REC1      OCCURS 2508 TIMES           PICTURE X.         VEGP0106

025130 01  PULLED-VARIES.                                                   VEGP0106
025140         05  VARI-FLD     OCCURS 5 TIMES.                             VEGP0106
025145             10  VARI-TAG                          PICTURE 9(3).      VEGP0106
025150             10  VARI-FLDA        COMPUTATIONAL    PICTURE S9(5).     VEGP0106
025160             10  VARI-FLDB.                                           VEGP0106
025170                 15  VARI-FLDC  OCCURS 100 TIMES PICTURE X.           VEGP0106

025180 01  CTL-SELECTS       VALUE ZEROS                 PICTURE X(15).     VEGP0106
025190 01  SAVE-SELECTS      REDEFINES CTL-SELECTS.                         VEGP0106
025200         05  SELEC-TAG    OCCURS 5 TIMES           PICTURE 999.       VEGP0106

026010 01  SORT-REC.                                                        VEGP0106
026020         05  S-POS1                                PICTURE 9.         VEGP0106
026030         05  S-POS2-3-4                            PICTURE XXX.       VEGP0106
026040         05  S-POS5                                PICTURE 9.         VEGP0106
026050         05  S-POS6                                PICTURE 9.         VEGP0106

026060 01  SAVED-SORT.                                                      VEGP0106
```

FIGURE A.2, cont.

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   5

00226    026070       05  PREV1                                  PICTURE 9.            VEGP0106
00227    026080       05  PREV2-3-4                              PICTURE XXX.          VEGP0106
00228    026090       05  PREV-MIN                               PICTURE 9.            VEGP0106
00229    026100       05  PREV6                                  PICTURE 9.            VEGP0106
00230    026101 01  REDEF-SAVED-SORT REDEFINES SAVED-SORT.                              VEGP0106
00231    026102       05  RDF-1                                  PICTURE 9.            VEGP0106
00232    026103       05  RDF-2-3.                                                     VEGP0106
00233    026104           10  RDF2                               PICTURE X.            VEGP0106
00234    026105           10  RDF3                               PICTURE X.            VEGP0106
00235    026106       05  RDF-4-5.                                                     VEGP0106
00236    026107           10  RDF4                               PICTURE 9.            VEGP0106
00237    026108           10  RDF5                               PICTURE 9.            VEGP0106
00238    026109       05  RDF-RDF45   REDEFINES RDF-4-5          PICTURE 99.           VEGP0106
00239    02511A       05  RDF-6                                  PICTURE 9.            VEGP0106
00240
00241    026110 01  BILD-OUTREC.                                                       VEGP0106
00242    026120       05  POS1                                   PICTURE 9.            VEGP0106
00243    026130       05  POS2-3.                                                      VEGP0106
00244    026140           10  POS2                               PICTURE X.            VEGP0106
00245    026150           10  POS3                               PICTURE X.            VEGP0106
00246    026160       05  POS4-5.                                                      VEGP0106
00247    026170           10  POS4                               PICTURE X.            VEGP0106
00248    026180           10  POS5                               PICTURE X.            VEGP0106
00249    026190       05  POS6                                   PICTURE 9.            VEGP0106
00250
00251    027010 01  LC-HOLD.                                                           VEGP0106
00252    027020       05  MAJ-LTR                                PICTURE X.            VEGP0106
00253    027030       05  MIN-LTR                                PICTURE X.            VEGP0106
00254    027040 01  DEWEY-HOLD.                                                        VEGP0106
00255    027050       05  MAJ-NUM                                PICTURE 9.            VEGP0106
00256    027060       05  MIN-NUM                                PICTURE 9.            VEGP0106
00257    027070 01  REDEF-DEWEY-HOLD    REDEFINES DEWEY-HOLD.                          VEGP0106
00258    027080       05  MAJ-AN                                 PICTURE X.            VEGP0106
00259    027090       05  MIN-AN                                 PICTURE X.            VEGP0106
00260    027100 01  DEWEY-NUMBER    REDEFINES REDEF-DEWEY-HOLD  PICTURE 99.            VEGP0106
00261
00262    027110 01  TBL-NUM-CTS     VALUE ZERO                   PICTURE X(500).       VEGP0106
00263    027120 01  R-TBL-NUM-CTS   REDEFINES TBL-NUM-CTS.                             VEGP0106
00264    027130       05  TBL-CT      OCCURS 100 TIMES           PICTURE 9(5).         VEGP0106
00265    027131 01  TABLE-GROUPS    REDEFINES R-TBL-NUM-CTS.                           VEGP0106
00266    027132       05  GRP-OF-10   OCCURS 10 TIMES.                                 VEGP0106
00267    027133           10  G0                                 PICTURE 9(5).         VEGP0106
00268    027134           10  G1                                 PICTURE 9(5).         VEGP0106
00269    027135           10  G2                                 PICTURE 9(5).         VEGP0106
00270    027136           10  G3                                 PICTURE 9(5).         VEGP0106
00271    027137           10  G4                                 PICTURE 9(5).         VEGP0106
00272    027138           10  G5                                 PICTURE 9(5).         VEGP0106
00273    027139           10  G6                                 PICTURE 9(5).         VEGP0106
00274    02714A           10  G7                                 PICTURE 9(5).         VEGP0106
00275    02714B           10  G8                                 PICTURE 9(5).         VEGP0106
00276    02714C           10  G9                                 PICTURE 9(5).         VEGP0106
00277
00278    027140 01  STAT-CTS.                                                          VEGP0106
00279    027150       05  INRECS      VALUE 0                    PICTURE 9(6).         VEGP0106
00280    027160       05  OK-IN       VALUE 0                    PICTURE 9(6).         VEGP0106
00281    027170       05  NG-LC       VALUE 0                    PICTURE 9(6).         VEGP0106
00282    027180       05  NG-DWY      VALUE 0                    PICTURE 9(6).         VEGP0106
```

FIGURE A.2, cont.

6

```
027190    05  DUP-LC       VALUE 0                 PICTURE 9(6).        VEGP0106
027200    05  DUP-DWY      VALUE 0                 PICTURE 9(6).        VEGP0106

028010 01 HEAD1.                                                        VEGP0106
028020    05  MAJ-MIN      VALUE '  MAJOR '        PICTURE X(8).        VEGP0106
028030    05  FILLER       VALUE 'MATRIX  '        PICTURE X(8).        VEGP0106
028040    05  HD15         VALUE SPACE             PICTURE X.           VEGP0106
028050    05  HD16         VALUE SPACE             PICTURE X.           VEGP0106
028060    05  FILLER       VALUE SPACE             PICTURE X(38).       VEGP0106
028070    05  FILLER                               PICTURE X(70)  VALUE VEGP0106
028080        'WASHINGTON STATE LIBRARY'.                               VEGP0106
028090    05  FILLER       VALUE 'R'               PICTURE X.           VEGP0106
028100    05  RPTNO        VALUE 20                PICTURE 99.          VEGP0106
028110    05  FILLER       VALUE '06385'           PICTURE X(5).        VEGP0106

028120 01 HEAD2.                                                        VEGP0106
028130    05  FILLER       VALUE SPACE             PICTURE XX.          VEGP0106
028140    05  RPTMO                                PICTURE Z9.          VEGP0106
028150    05  FILLER       VALUE '-'               PICTURE X.           VEGP0106
028160    05  RPTDY                                PICTURE Z9.          VEGP0106
028170    05  FILLER       VALUE '-'               PICTURE X.           VEGP0106
028180    05  RPTYR                                PICTURE 99.          VEGP0106
028190    05  FILLER       VALUE SPACE             PICTURE X(23).       VEGP0106
028200    05  FILLER                               PICTURE X(92)  VALUE VEGP0106
028210        'CORRELATION MATRIX COMPARING DEWEY DECIMAL AND LC NUMBERIVEGP0106
028220-       'NG SYSTEMS'.                                             VEGP0106
028230    05  FILLER       VALUE 'PAGE '           PICTURE X(5).        VEGP0106
028240    05  PAGENUM                              PICTURE ZZ9.         VEGP0106

029010 01 HEAD3.                                                        VEGP0106
029020    05  FILLER                               PICTURE X(96)  VALUE VEGP0106
029030        '   LC    DEWEY 0     DEWEY 1     DEWEY 2     DEWEY 3      VEGP0106
029040-       'DEWEY 4     DEWEY 5     DEWEY 6     DEW'.                VEGP0106
029050    05  FILLER                               PICTURE X(37)  VALUE VEGP0106
029060        'EY 7     DEWEY 8     DEWEY 9    TOTAL'.                  VEGP0106

029061 01 WK-PRT1-PARTIAL.                                              VEGP0106
029062    05  WITHOUT-TOT                          PICTURE X(127).      VEGP0106
029063    05  FILLER                               PICTURE X(6).        VEGP0106
029070 01 WK-PRINT1   REDEFINES WK-PRT1-PARTIAL.                        VEGP0106
029080    05  FILLER                               PICTURE XXXX.        VEGP0106
029090    05  LC-X                                 PICTURE XXX.         VEGP0106
029100    05  DTL-COL-1   OCCURS 10 TIMES.                              VEGP0106
029110        10  TOT-PART                         PICTURE Z(5).        VEGP0106
029120        10  PCT-PART-1                       PICTURE ZZZ.9.       VEGP0106
029130        10  PCT-CHAR-1                       PICTURE XX.          VEGP0106
029140    05  LINE-TOT                             PICTURE Z(6).        VEGP0106

029180 01 WK-PRINT2.                                                    VEGP0106
029190    05  FILLER                               PICTURE X(12).       VEGP0106
029200    05  DTL-COL-2   OCCURS 10 TIMES.                              VEGP0106
029210        10  PCT-PART-2                       PICTURE ZZZ.9.       VEGP0106
029220        10  PCT-CHAR-2                       PICTURE X(7).        VEGP0106
029230    05  FILLER                               PICTURE X.           VEGP0106

030010 01 WK-PRINT3.                                                    VEGP0106
030020    05  FILLER       VALUE ' TOTAL '         PICTURE X(7).        VEGP0106
```

FIGURE A.2, cont.

```
030030   05  PRT3-TO-CLR.                              VEGP0106
030040       10  COL-TOTS    OCCURS 10 TIMES.          VEGP0106
030050           15  COL-TOT           PICTURE Z(5).   VEGP0106
030060           15  FILLER            PICTURE X(7).   VEGP0106
030070       10  COL-GRND              PICTURE Z(6).   VEGP0106

031010 01  STAT-RPT.                                   VEGP0106
031020     05  FILLER                  PICTURE XX.     VEGP0106
031030     05  STAT-DATE               PICTURE X(8).   VEGP0106
031040     05  S-COL10-29              PICTURE X(20).  VEGP0106
031050     05  S-COL30-53.                             VEGP0106
031060         10  CT-COL1             PICTURE Z(6).   VEGP0106
031070         10  FILLER              PICTURE X.      VEGP0106
031080         10  CT-COL2             PICTURE Z(6).   VEGP0106
031090         10  FILLER              PICTURE XX.     VEGP0106
031100         10  CT-COL3             PICTURE Z(6).   VEGP0106
031110         10  FILLER              PICTURE XXX.    VEGP0106
031120     05  FILLER                  PICTURE X(20).  VEGP0106
031130     05  S-RPTNO                 PICTURE X(8).   VEGP0106

031140 01  BILD-SDATE.                                 VEGP0106
031150     05  STAT-MO                 PICTURE Z9.     VEGP0106
031160     05  FILLER      VALUE '-'   PICTURE X.      VEGP0106
031170     05  STAT-DY                 PICTURE Z9.     VEGP0106
031180     05  FILLER      VALUE '-'   PICTURE X.      VEGP0106
031190     05  STAT-YR                 PICTURE 99.     VEGP0106
031200 01  STDATE                      PICTURE 9(6).   VEGP0106
031210 01  REDEF-STDATE    REDEFINES STDATE.           VEGP0106
031220     05  ST-YR                   PICTURE 99.     VEGP0106
031230     05  ST-MO                   PICTURE 99.     VEGP0106
031240     05  ST-DY                   PICTURE 99.     VEGP0106

050010 PROCEDURE DIVISION.                             VEGP0106
050020     ENTER LINKAGE.                              VEGP0106
050030     CALL 'TIMEDATE' USING TIME, JDATE, STDATE.  VEGP0106
050040     ENTER COBOL.                                VEGP0106
050050     MOVE ST-MO TO RPTMO, STAT-MO.               VEGP0106
050060     MOVE ST-DY TO RPTDY, STAT-DY.               VEGP0106
050070     MOVE ST-YR TO RPTYR, STAT-YR.               VEGP0106
050080     OPEN INPUT CTL-CARD, OUTPUT RO.             VEGP0106
050085     READ CTL-CARD AT END GO TO NG-CTL.          VEGP0106
050090     IF NOT GOOD-CTL GO TO NG-CTL.               VEGP0106
050100     IF TAG1 NUMERIC AND TAG2 NUMERIC NEXT SENTENCE    ELSE  VEGP0106
050110       GO TO NG-CTL.                             VEGP0106
050120     MOVE TAG1 TO SELEC-TAG (1), MOVE TAG2 TO SELEC-TAG (2).  VEGP0106
050130     IF TAG3 NUMERIC MOVE TAG3 TO SELEC-TAG (3). VEGP0106
050140     IF TAG4 NUMERIC MOVE TAG4 TO SELEC-TAG (4). VEGP0106
050150     IF TAG5 NUMERIC MOVE TAG5 TO SELEC-TAG (5). VEGP0106
050160     GO TO GOOD-CTLCARD.                         VEGP0106
050170 NG-CTL.                                         VEGP0106
050180     MOVE '     MISSING OR INVALID CONTROL CARD FOR P0106385' TO VEGP0106
050190       PRTO.                                     VEGP0106
050200     WRITE PRTO  AFTER ADVANCING 0 LINES.        VEGP0106
050210     CLOSE CTL-CARD, RO.                         VEGP0106
050220     STOP RUN.                                   VEGP0106

051010 GOOD-CTLCARD.                                   VEGP0106
```

FIGURE A.2, cont.

```
9

  051020     SORT SORT-THESE ASCENDING KEY PRIME6,                          VEGP0106
  051030       INPUT PROCEDURE  BILD-THE-RECS,                              VEGP0106
  051040       OUTPUT PROCEDURE RETURN-THE-RECS.                            VEGP0106
  051050       STOP RUN.                                                    VEGP0106

  051060 BILD-THE-RECS SECTION.                                             VEGP0106
  051070 OPEN-MSTR.                                                         VEGP0106
  051080     OPEN INPUT BASE-MSTR.                                          VEGP0106
  055051     OPEN OUTPUT R1.
  055052     OPEN OUTPUT R2.
  055053     OPEN OUTPUT R3.
  055054     OPEN OUTPUT R4.
  055055     OPEN OUTPUT R5.
  055056     OPEN OUTPUT R6.
  055057     OPEN OUTPUT R7.
  055058     OPEN OUTPUT R8.
  055059     OPEN OUTPUT R9.
  055060     OPEN OUTPUT R10.
  055061     OPEN OUTPUT R11.

**051090 READ-MSTR.                                                         VEGP0106
  051100     READ BASE-MSTR AT END GO TO CLOSE-MSTR.                        VEGP0106
  051110     ADD 1 TO INRECS.                                               VEGP0106
  051120     MOVE DATA-BASE TO WORK-MAST-A.                                 VEGP0106
  051130     PERFORM GET-THE-VERBLES THRU EXIT-VARY-GETS.                   VEGP0106
  051140     MOVE SPACES TO LC-HOLD, DEWEY-HOLD.                            VEGP0106
  051150     MOVE 1 TO PULL-BMP.                                            VEGP0106
  051160 CK-TAG050.                                                         VEGP0106
  051170     IF VARI-TAG (PULL-BMP) NOT = 050 GO TO CK-5-50S.               VEGP0106
  051180     IF LC-HOLD NOT = SPACES ADD 1 TO DUP-LC, MOVE 1 TO PULL-BMP,   VEGP0106
  051190       GO TO CK-TAG082.                                             VEGP0106
  051200     MOVE VARI-FLDC (PULL-BMP, 5) TO MAJ-LTR.                       VEGP0106
  051210     MOVE VARI-FLDC (PULL-BMP, 6) TO MIN-LTR.                       VEGP0106
  052010 CK-5-50S.                                                          VEGP0106
  052020     IF PULL-BMP □ 5 ADD 1 TO PULL-BMP, GO TO CK-TAG050.            VEGP0106
  052030     IF LC-HOLD = SPACES ADD 1 TO NG-LC, GO TO READ-MSTR.           VEGP0106
  052040     MOVE 1 TO PULL-BMP.                                            VEGP0106

  052050 CK-TAG082.                                                         VEGP0106
  052060     IF VARI-TAG (PULL-BMP) NOT = 082 GO TO CK-5-82S.               VEGP0106
  052070     IF DEWEY-HOLD NOT = SPACES ADD 1 TO DUP-DWY,                   VEGP0106
  052080       GO TO GOOD-1-EACH.                                           VEGP0106
  052090     MOVE VARI-FLDC (PULL-BMP, 5) TO MAJ-AN.                        VEGP0106
  052100     MOVE VARI-FLDC (PULL-BMP, 6) TO MIN-AN.                        VEGP0106
  052110     IF DEWEY-NUMBER NOT NUMERIC MOVE SPACES TO DEWEY-HOLD GO
  052111       TO CK-5-82S.
  052112     IF DEWEY-NUMBER NEGATIVE MOVE SPACES TO DEWEY-HOLD.
  052120 CK-5-82S.                                                          VEGP0106
  052130     IF PULL-BMP □ 5 ADD 1 TO PULL-BMP, GO TO CK-TAG082.            VEGP0106
  052140     IF DEWEY-HOLD = SPACES ADD 1 TO NG-DWY, GO TO READ-MSTR.       VEGP0106

  052150 GOOD-1-EACH.                                                       VEGP0106
  052155     ADD 1 TO OK-IN.                                                VEGP0106
~~**052152     IF MAJ-LTR □ 'P' GO TO COMPUTE-OVERALL.                      TEMP~~ removed from source
  052160     MOVE '0'          TO BILD-OUTREC.                              VEGP0106
  052170     MOVE MAJ-LTR      TO POS2.                                     VEGP0106
  052180     MOVE 0            TO POS6.                                     VEGP0106
```

FIGURE A.2, cont.

```
052190      MOVE BILD-OUTREC TO REAL-REC.                           VEGP0106
052200      RELEASE REAL-REC.                                       VEGP0106
053010      MOVE MAJ-NUM      TO POS5.                              VEGP0106
053020      MOVE 1           TO POS6.                               VEGP0106
053030      MOVE BILD-OUTREC TO REAL-REC.                           VEGP0106
053040      RELEASE REAL-REC.                                       VEGP0106
053050      MOVE '1'          TO BILD-OUTREC.                       VEGP0106
053060      MOVE LC-HOLD      TO POS2-3.                            VEGP0106
053070      MOVE 0            TO POS6.                              VEGP0106
053080      MOVE BILD-OUTREC TO REAL-REC.                           VEGP0106
053090      RELEASE REAL-REC.                                       VEGP0106
053100      MOVE DEWEY-HOLD  TO POS4-5.                             VEGP0106
053110      MOVE 1            TO POS6.                              VEGP0106
053120      MOVE BILD-OUTREC TO REAL-REC.                           VEGP0106
053130      RELEASE REAL-REC.                                       VEGP0106
053135 COMPUTE-OVERALL.
053140      COMPUTE DEWEY-SUBS = DEWEY-NUMBER + 1.                  VEGP0106
053150      ADD 1 TO TBL-CT (DEWEY-SUBS).   ADD 1 TO OVERALL.       VEGP0106
053160      GO TO READ-MSTR.                                        VEGP0106

054010 GET-THE-VERBLES.                                             VEGP0106
054020      MOVE ZEROS TO PULLED-VARIES.                            VEGP0106
054030      MOVE 25 TO REC-LOC.                                     VEGP0106
054040      MOVE 1 TO DIREC-BMP, PULL-BMP.                          VEGP0106
054050 CK-DIREC-DUN.                                                VEGP0106
054060      IF REC-LOC ¤ BASE-ADR GO TO CK-NXT-TAG.                 VEGP0106
054070 EXIT-VARY-GETS.     EXIT.                                    VEGP0106

054080 CK-NXT-TAG.                                                  VEGP0106
054090      IF TAG (DIREC-BMP) = SELEC-TAG (1) OR SELEC-TAG (2) OR  VEGP0106
054100        SELEC-TAG (3) OR SELEC-TAG (4) OR SELEC-TAG (5) NEXT  VEGP0106
054110        SENTENCE ELSE GO TO BUMP-DIREC-FLD.                   VEGP0106
054120      COMPUTE SAVE-BASE = 1 + BASE-ADR + DISPL (DIREC-BMP).   VEGP0106
054130      MOVE 1 TO VARI-BMP.                                     VEGP0106
054135      MOVE TAG (DIREC-BMP) TO VARI-TAG (PULL-BMP).            VEGP0106
054140      MOVE LGTH (DIREC-BMP) TO VARI-FLDA (PULL-BMP).          VEGP0106
054150 MUV-VARY-BYTE.                                               VEGP0106
054160      MOVE REC1 (SAVE-BASE) TO VARI-FLDC (PULL-BMP, VARI-BMP). VEGP0106
054170      ADD 1 TO SAVE-BASE,      ADD 1 TO VARI-BMP.             VEGP0106
054180      IF VARI-BMP NOT   VARI-FLDA (PULL-BMP) GO TO MUV-VARY-BYTE. VEGP0106
054190      IF PULL-BMP   4 GO TO EXIT-VARY-GETS.                   VEGP0106
054200      ADD 1 TO PULL-BMP.                                      VEGP0106
054210 BUMP-DIREC-FLD.                                              VEGP0106
054220      ADD 12 TO REC-LOC.       ADD 1 TO DIREC-BMP.            VEGP0106
054230      GO TO CK-DIREC-DUN.                                     VEGP0106

055010 CLOSE-MSTR.                                                  VEGP0106
055020      CLOSE BASE-MSTR, CTL-CARD.                              VEGP0106
055030 EXIT-SECT1.     EXIT.                                        VEGP0106

055040 RETURN-THE-RECS SECTION.                                     VEGP0106
055050 OPEN-REPTS.                                                  VEGP0106
055065      MOVE SPACES TO WK-PRINT1, WK-PRINT2, PRT3-TO-CLR.       VEGP0106

055070 READ-SORTED.                                                 VEGP0106
055080      RETURN SORT-THESE AT END MOVE '999999' TO SORT-REC,     VEGP0106
055090        GO TO CK-EQU-RECS.                                    VEGP0106
```

FIGURE A.2, cont.

```
10

055100     MOVE REAL-REC TO SORT-REC.                                   VEGP0106
055110     IF FIRST-RETURN = 1 MOVE 0 TO FIRST-RETURN, GO TO SAV-NEW-R. VEGP0106
055120 CK-EQU-RECS.                                                     VEGP0106
055130     IF SORT-REC = SAVED-SORT ADD 1 TO TEMP-REC-CT,               VEGP0106
055140       GO TO READ-SORTED.                                         VEGP0106
055150     IF PREV6 = 0 MOVE SPACES TO WITHOUT-TOT, MOVE TEMP-REC-CT TO VEGP0106
055160       LINE-TOT, LINE-TOT-SAV, GO TO CLR-TEMP-CTR.                VEGP0106
055170     COMPUTE PRT-SUBS = PREV-MIN + 1.                             VEGP0106
055180     MOVE TEMP-REC-CT TO TOT-PART (PRT-SUBS).                     VEGP0106
055190     IF PREV1 = 0 GO TO PCT-ALIKE.                                VEGP0106
055195     COMPUTE DEWEY-SUBS = RDF-RDF45 + 1.                          VEGP0106
055200     COMPUTE PCT-RESULT ROUNDED =                                 VEGP0106
055210       (TEMP-REC-CT * 100) / LINE-TOT-SAV.                        VEGP0106
055220     MOVE PCT-RESULT TO PCT-PART-1 (PRT-SUBS).                    VEGP0106
055230     MOVE '%'        TO PCT-CHAR-1 (PRT-SUBS).                    VEGP0106
056010     COMPUTE PCT-RESULT ROUNDED =                                 VEGP0106
056020      (TEMP-REC-CT * 100) / TBL-CT (DEWEY-SUBS).                  VEGP0106
056030     MOVE PCT-RESULT TO PCT-PART-2 (PRT-SUBS).                    VEGP0106
056040     MOVE '%'        TO PCT-CHAR-2 (PRT-SUBS).                    VEGP0106
056050     GO TO CK-POS234.                                             VEGP0106

056060 PCT-ALIKE.                                                       VEGP0106
056070     COMPUTE PCT-RESULT ROUNDED =                                 VEGP0106
056080       (TEMP-REC-CT * 100) / OVERALL.                             VEGP0106
056090     MOVE PCT-RESULT TO PCT-PART-1 (PRT-SUBS),                    VEGP0106
056100                        PCT-PART-2 (PRT-SUBS).                    VEGP0106
056110     MOVE '%' TO PCT-CHAR-1 (PRT-SUBS), PCT-CHAR-2 (PRT-SUBS).    VEGP0106
056120 CK-POS234.                                                       VEGP0106
057010     IF S-POS2-3-4 NOT = PREV2-3-4 GO TO PRNT-RTNE.                EGP0106
057020 CLR-TEMP-CTR.                                                     EGP0106
057030     MOVE 0 TO TEMP-REC-CT.                                        EGP0106
057040 SAV-NEW-R.                                                        EGP0106
057050     MOVE SORT-REC TO SAVED-SORT.                                  EGP0106
057060     ADD 1 TO TEMP-REC-CT.                                         EGP0106
057070     GO TO READ-SORTED.                                            EGP0106

057080 PRNT-RTNE.                                                        EGP0106
057090     IF PREV1 = 0 GO TO MAJ-DETAILS.                               EGP0106
057100     IF 1ST-MIN = 1 MOVE 0 TO 1ST-MIN, GO TO MAJ-TOTALS.           EGP0106
057110     IF RDF2 NOT = SAV-MAJ-LTR GO TO MIN-TOTALS.                   EGP0106

057130 MIN-DETAILS.                                                      EGP0106
057140     IF RDF4 = 0 GO TO CK-HED-R10.                                 EGP0106
057150     IF RDF4 = 1 GO TO CK-HED-R11.                                 EGP0106
057160     IF RDF4 = 2 GO TO CK-HED-R12.                                 EGP0106
057170     IF RDF4 = 3 GO TO CK-HED-R13.                                 EGP0106
057180     IF RDF4 = 4 GO TO CK-HED-R14.                                 EGP0106
057190     IF RDF4 = 5 GO TO CK-HED-R15.                                 EGP0106
057200     IF RDF4 = 6 GO TO CK-HED-R16.                                 EGP0106
057210     IF RDF4 = 7 GO TO CK-HED-R17.                                 EGP0106
057220     IF RDF4 = 8 GO TO CK-HED-R18.                                 EGP0106
057230     IF RDF4 = 9 GO TO CK-HED-R19.                                 EGP0106
058010 CLR-P1-2.                                                         EGP0106
058020     MOVE SPACES TO WITHOUT-TOT, WK-PRINT2.                        EGP0106
058025     IF SORT-REC = '999999' GO TO MIN-TOTALS.                     VEGP0106
058030     GO TO CLR-TEMP-CTR.                                           EGP0106
```

FIGURE A.2, cont.

```
00568    058040 MAJ-DETAILS.                                                      EGP0106
00569    058050     IF 1ST-REC = 0 GO TO MAJ-IS-HEADED.                           EGP0106
00570    058060     MOVE 0 TO 1ST-REC.                                            EGP0106
00571    058070     WRITE PRT11  FROM HEAD1 AFTER ADVANCING 0 LINES.              EGP0106
00572    058080     MOVE 1 TO PAGENUM.                                            EGP0106
00573    058090     WRITE PRT11  FROM HEAD2 AFTER ADVANCING 1 LINES.              EGP0106
00574    058100     WRITE PRT11  FROM HEAD3 AFTER ADVANCING 2 LINES.              EGP0106
00575    058110     MOVE SPACES TO PRT11.                                         EGP0106
00576    058120     WRITE PRT11  AFTER ADVANCING 1 LINES.                         EGP0106
00577
00578    058130 MAJ-IS-HEADED.                                                    EGP0106
00579    058140     MOVE RDF2 TO LC-X.                                            EGP0106
00580    058150     WRITE PRT11  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          EGP0106
00581    058160     WRITE PRT11  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          EGP0106
00582    058180     GO TO CLR-P1-2.                                              VEGP0106
00583    058190 MAJ-TOTALS.                                                       EGP0106
00584    058200     ADD 1 TO TENX.                                                EGP0106
00585    058210     COMPUTE BIG-TOT = G0 (TENX) + G1 (TENX)  + G2 (TENX)          EGP0106
00586    058220                     + G3 (TENX) + G4 (TENX) + G5 (TENX)           EGP0106
00587    058230                     + G6 (TENX) + G7 (TENX) + G8 (TENX)           EGP0106
00588    058240                     + G9 (TENX).                                  EGP0106
00589    059010     MOVE BIG-TOT TO COL-TOT (TENX).                               EGP0106
00590    059012     IF TENX ¤ 10 GO TO MAJ-TOTALS.                                EGP0106
00591    059014     MOVE 0 TO TENX.                                               EGP0106
00592    059020     MOVE OVERALL TO COL-GRND.                                     EGP0106
00593    059030     WRITE PRT11  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.          EGP0106
00594    059040     MOVE SPACES TO PRT3-TO-CLR.                                   EGP0106
00595    059050     MOVE RDF2 TO SAV-MAJ-LTR.                                     EGP0106
00596    059055     MOVE '  MINOR ' TO MAJ-MIN.                                  VEGP0106
00597    059060     GO TO MIN-DETAILS.                                            EGP0106
00598
00599    059070 CK-HED-R10.                                                       EGP0106
00600    059080     IF RPT10-SWT = 1 GO TO R10-HEADED.                            EGP0106
00601    059090     MOVE 1 TO RPT10-SWT.                                          EGP0106
00602    059100     MOVE RDF2 TO HD15.                                            EGP0106
00603    059110     MOVE RDF4 TO HD16.                                            EGP0106
00604    059120     MOVE 10   TO RPTNO.                                           EGP0106
00605    059130     ADD 1 TO PAGECT1,   MOVE PAGECT1 TO PAGENUM.                  EGP0106
00606    059140     WRITE PRT1  FROM HEAD1 AFTER ADVANCING 0 LINES.               EGP0106
00607    059150     WRITE PRT1  FROM HEAD2 AFTER ADVANCING 1 LINES.               EGP0106
00608    059160     WRITE PRT1  FROM HEAD3 AFTER ADVANCING 2 LINES.               EGP0106
00609    059170     MOVE SPACES TO PRT1.                                          EGP0106
00610    059180     WRITE PRT1 AFTER ADVANCING 1 LINES.                           EGP0106
00611    059190 R10-HEADED.                                                       EGP0106
00612    059200     MOVE RDF3 TO LC-X.                                            EGP0106
00613    060010     WRITE PRT1  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.           EGP0106
00614    060020     WRITE PRT1  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.           EGP0106
00615    060030     GO TO CLR-P1-2.                                               EGP0106
00616
00617    061010 CK-HED-R11.                                                       EGP0106
00618    061020     IF RPT11-SWT = 1 GO TO R11-HEADED.                            EGP0106
00619    061030     MOVE 1 TO RPT11-SWT.                                          EGP0106
00620    061040     MOVE RDF2 TO HD15.                                            EGP0106
00621    061050     MOVE RDF4 TO HD16.                                            EGP0106
00622    061060     MOVE 11   TO RPTNO.                                           EGP0106
00623    061070     ADD 1 TO PAGECT2    MOVE PAGECT2  TO PAGENUM.                 EGP0106
00624    061080     WRITE PRT2  FROM HEAD1 AFTER ADVANCING 0 LINES.               EGP0106
```

FIGURE A.2, cont.

```
061090        WRITE PRT2  FROM HEAD2 AFTER ADVANCING 1 LINES.              EGP0106
061100        WRITE PRT2  FROM HEAD3 AFTER ADVANCING 2 LINES.              EGP0106
061110        MOVE SPACES TO PRT2.                                         EGP0106
061120        WRITE PRT2  AFTER ADVANCING 1 LINES.                         EGP0105
061130 R11-HEADED.                                                         EGP0106
061140        MOVE RDF3 TO LC-X.                                           EGP0106
061150        WRITE PRT2  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          EGP0106
061160        WRITE PRT2  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          EGP0106
061170        GO TO CLR-P1-2.                                              EGP0106

062010 CK-HED-R12.                                                         EGP0106
062020        IF RPT12-SWT = 1 GO TO R12-HEADED.                           EGP0106
062030        MOVE 1 TO RPT12-SWT.                                         EGP0106
062040        MOVE RDF2 TO HD15.                                           EGP0106
062050        MOVE RDF4 TO HD16.                                           EGP0106
062060        MOVE 12   TO RPTNO.                                          EGP0106
062070        ADD 1 TO PAGECT3     MOVE PAGECT3  TO PAGENUM.               EGP0106
062080        WRITE PRT3  FROM HEAD1 AFTER ADVANCING 0 LINES.              EGP0106
062090        WRITE PRT3  FROM HEAD2 AFTER ADVANCING 1 LINES.              EGP0106
062100        WRITE PRT3  FROM HEAD3 AFTER ADVANCING 2 LINES.              EGP0106
062110        MOVE SPACES TO PRT3.                                         EGP0106
062120        WRITE PRT3  AFTER ADVANCING 1 LINES.                         EGP0106
062130 R12-HEADED.                                                         EGP0106
062140        MOVE RDF3 TO LC-X.                                           EGP0106
062150        WRITE PRT3  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          EGP0106
062160        WRITE PRT3  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          EGP0106
062170        GO TO CLR-P1-2.                                              EGP0106

063010 CK-HED-R13.                                                         EGP0106
063020        IF RPT13-SWT = 1 GO TO R13-HEADED.                           EGP0106
063030        MOVE 1 TO RPT13-SWT.                                         EGP0106
063040        MOVE RDF2 TO HD15.                                           EGP0106
063050        MOVE RDF4 TO HD16.                                           EGP0106
063060        MOVE 13   TO RPTNO.                                          EGP0106
063070        ADD 1 TO PAGECT4     MOVE PAGECT4  TO PAGENUM.               EGP0106
063080        WRITE PRT4  FROM HEAD1 AFTER ADVANCING 0 LINES.              EGP0106
063090        WRITE PRT4  FROM HEAD2 AFTER ADVANCING 1 LINES.              EGP0106
063100        WRITE PRT4  FROM HEAD3 AFTER ADVANCING 2 LINES.              EGP0106
063110        MOVE SPACES TO PRT4.                                         EGP0106
063120        WRITE PRT4  AFTER ADVANCING 1 LINES.                         EGP0106
063130 R13-HEADED.                                                         EGP0106
063140        MOVE RDF3 TO LC-X.                                           EGP0106
063150        WRITE PRT4  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          EGP0106
063160        WRITE PRT4  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          EGP0106
063170        GO TO CLR-P1-2.                                              EGP0106

064010 CK-HED-R14.                                                        VEGP0106
064020        IF RPT14-SWT = 1 GO TO R14-HEADED.                          VEGP0106
064030        MOVE 1 TO RPT14-SWT.                                        VEGP0106
064040        MOVE RDF2 TO HD15.                                          VEGP0106
064050        MOVE RDF4 TO HD16.                                          VEGP0106
064060        MOVE 14   TO RPTNO.                                         VEGP0106
064070        ADD 1 TO PAGECT5     MOVE PAGECT5  TO PAGENUM.              VEGP0106
064080        WRITE PRT5  FROM HEAD1 AFTER ADVANCING 0 LINES.             VEGP0106
064090        WRITE PRT5  FROM HEAD2 AFTER ADVANCING 1 LINES.             VEGP0106
064100        WRITE PRT5  FROM HEAD3 AFTER ADVANCING 2 LINES.             VEGP0106
064110        MOVE SPACES TO PRT5.                                        VEGP0106
```

FIGURE A.2, cont.

```
064120     WRITE PRT5  AFTER ADVANCING 1 LINES.                          VEGP0106
064130 R14-HEADED.                                                       VEGP0106
064140     MOVE RDF3 TO LC-X.                                            VEGP0106
064150     WRITE PRT5  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.           VEGP0106
064160     WRITE PRT5  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.           VEGP0106
064170     GO TO CLR-P1-2.                                               VEGP0106

065010 CK-HED-R15.                                                       VEGP0106
065020     IF RPT15-SWT = 1 GO TO R15-HEADED.                            VEGP0106
065030     MOVE 1 TO RPT15-SWT.                                          VEGP0106
065040     MOVE RDF2 TO HD15.                                            VEGP0106
065050     MOVE RDF4 TO HD16.                                            VEGP0106
065060     MOVE 15   TO RPTNO.                                           VEGP0106
065070     ADD 1 TO PAGECT6    MOVE PAGECT6  TO PAGENUM.                 VEGP0106
065080     WRITE PRT6  FROM HEAD1 AFTER ADVANCING 0 LINES.               VEGP0106
065090     WRITE PRT6  FROM HEAD2 AFTER ADVANCING 1 LINES.               VEGP0106
065100     WRITE PRT6  FROM HEAD3 AFTER ADVANCING 2 LINES.               VEGP0106
065110     MOVE SPACES TO PRT6.                                          VEGP0106
065120     WRITE PRT6  AFTER ADVANCING 1 LINES.                          VEGP0106
065130 R15-HEADED.                                                       VEGP0106
065140     MOVE RDF3 TO LC-X.                                            VEGP0106
065150     WRITE PRT6  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.           VEGP0106
065160     WRITE PRT6  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.           VEGP0106
065170     GO TO CLR-P1-2.                                               VEGP0106

066010 CK-HED-R16.                                                       VEGP0106
066020     IF RPT16-SWT = 1 GO TO R16-HEADED.                            VEGP0106
066030     MOVE 1 TO RPT16-SWT.                                          VEGP0106
066040     MOVE RDF2 TO HD15.                                            VEGP0106
066050     MOVE RDF4 TO HD16.                                            VEGP0106
066060     MOVE 16   TO RPTNO.                                           VEGP0106
066070     ADD 1 TO PAGECT7    MOVE PAGECT7  TO PAGENUM.                 VEGP0106
066080     WRITE PRT7  FROM HEAD1 AFTER ADVANCING 0 LINES.               VEGP0106
066090     WRITE PRT7  FROM HEAD2 AFTER ADVANCING 1 LINES.               VEGP0106
066100     WRITE PRT7  FROM HEAD3 AFTER ADVANCING 2 LINES.               VEGP0106
066110     MOVE SPACES TO PRT7.                                          VEGP0106
066120     WRITE PRT7  AFTER ADVANCING 1 LINES.                          VEGP0106
066130 R16-HEADED.                                                       VEGP0106
066140     MOVE RDF3 TO LC-X.                                            VEGP0106
066150     WRITE PRT7  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.           VEGP0106
066160     WRITE PRT7  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.           VEGP0106
066170     GO TO CLR-P1-2.                                               VEGP0106

067010 CK-HED-R17.                                                       VEGP0106
067020     IF RPT17-SWT = 1 GO TO R17-HEADED.                            VEGP0106
067030     MOVE 1 TO RPT17-SWT.                                          VEGP0106
067040     MOVE RDF2 TO HD15.                                            VEGP0106
067050     MOVE RDF4 TO HD16.                                            VEGP0106
067060     MOVE 17   TO RPTNO.                                           VEGP0106
067070     ADD 1 TO PAGECT8    MOVE PAGECT8  TO PAGENUM.                 VEGP0106
067080     WRITE PRT8  FROM HEAD1 AFTER ADVANCING 0 LINES.               VEGP0106
067090     WRITE PRT8  FROM HEAD2 AFTER ADVANCING 1 LINES.               VEGP0106
067100     WRITE PRT8  FROM HEAD3 AFTER ADVANCING 2 LINES.               VEGP0106
067110     MOVE SPACES TO PRT8.                                          VEGP0106
067120     WRITE PRT8  AFTER ADVANCING 1 LINES.                          VEGP0106
067130 R17-HEADED.                                                       VEGP0106
067140     MOVE RDF3 TO LC-X.                                            VEGP0106
```

```
067150     WRITE PRT8  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          VEGP0106
067160     WRITE PRT8  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          VEGP0106
067170     GO TO CLR-P1-2.                                              VEGP0106

068010 CK-HED-R18.                                                      VEGP0106
068020     IF RPT18-SWT = 1 GO TO R18-HEADED.                           VEGP0106
068030     MOVE 1 TO RPT18-SWT.                                         VEGP0106
068040     MOVE RDF2 TO HD15.                                           VEGP0106
068050     MOVE RDF4 TO HD16.                                           VEGP0106
068060     MOVE 18   TO RPTNO.                                          VEGP0106
068070     ADD 1 TO PAGECT9    MOVE PAGECT9   TO PAGENUM.               VEGP0106
068080     WRITE PRT9  FROM HEAD1 AFTER ADVANCING 0 LINES.              VEGP0106
068090     WRITE PRT9  FROM HEAD2 AFTER ADVANCING 1 LINES.              VEGP0106
068100     WRITE PRT9  FROM HEAD3 AFTER ADVANCING 2 LINES.              VEGP0106
068110     MOVE SPACES TO PRT9.                                         VEGP0106
068120     WRITE PRT9  AFTER ADVANCING 1 LINES.                         VEGP0106
068130 R18-HEADED.                                                      VEGP0106
068140     MOVE RDF3 TO LC-X.                                           VEGP0106
068150     WRITE PRT9  FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          VEGP0106
068160     WRITE PRT9  FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          VEGP0106
068170     GO TO CLR-P1-2.                                              VEGP0106

069010 CK-HED-R19.                                                      VEGP0106
069020     IF RPT19-SWT = 1 GO TO R19-HEADED.                           VEGP0106
069030     MOVE 1 TO RPT19-SWT.                                         VEGP0106
069040     MOVE RDF2 TO HD15.                                           VEGP0106
069050     MOVE RDF4 TO HD16.                                           VEGP0106
069060     MOVE 19   TO RPTNO.                                          VEGP0106
069070     ADD 1 TO PAGECT10   MOVE PAGECT10 TO PAGENUM.                VEGP0106
069080     WRITE PRT10 FROM HEAD1 AFTER ADVANCING 0 LINES.              VEGP0106
069090     WRITE PRT10 FROM HEAD2 AFTER ADVANCING 1 LINES.              VEGP0106
069100     WRITE PRT10 FROM HEAD3 AFTER ADVANCING 2 LINES.              VEGP0106
069110     MOVE SPACES TO PRT10.                                        VEGP0106
069120     WRITE PRT10 AFTER ADVANCING 1 LINES.                         VEGP0106
069130 R19-HEADED.                                                      VEGP0106
069140     MOVE RDF3 TO LC-X.                                           VEGP0106
069150     WRITE PRT10 FROM WK-PRINT1 AFTER ADVANCING 1 LINES.          VEGP0106
069160     WRITE PRT10 FROM WK-PRINT2 AFTER ADVANCING 1 LINES.          VEGP0106
069170     GO TO CLR-P1-2.                                              VEGP0106
070010 MIN-TOTALS.                                                      VEGP0106
070020     IF RPT10-SWT = 0 GO TO CK-MIN-TOT11.                         VEGP0106
070030     MOVE 0 TO RPT10-SWT.                                         VEGP0106
070040     MOVE 1    TO TBL-SUBS.                                       VEGP0106
070050     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                 VEGP0106
070060     WRITE PRT1  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.          VEGP0106
070070     MOVE SPACES TO PRT3-TO-CLR.                                  VEGP0106
070080 CK-MIN-TOT11.                                                    VEGP0106
070090     IF RPT11-SWT = 0 GO TO CK-MIN-TOT12.                         VEGP0106
070100     MOVE 0 TO RPT11-SWT.                                         VEGP0106
070110     MOVE 11   TO TBL-SUBS.                                       VEGP0106
070120     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                 VEGP0106
070130     WRITE PRT2  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.          VEGP0106
070140     MOVE SPACES TO PRT3-TO-CLR.                                  VEGP0106
070150 CK-MIN-TOT12.                                                    VEGP0106
070160     IF RPT12-SWT = 0 GO TO CK-MIN-TOT13.                         VEGP0106
070170     MOVE 0    TO RPT12-SWT.                                      VEGP0106
070180     MOVE 21   TO TBL-SUBS.                                       VEGP0106
```

FIGURE A.2, cont.

```
070190     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
070200     WRITE PRT3  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
070210     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
071010 CK-MIN-TOT13.                                                   VEGP0106
071020     IF RPT13-SWT = 0 GO TO CK-MIN-TOT14.                        VEGP0106
071030     MOVE 0 TO RPT13-SWT.                                        VEGP0106
071040     MOVE 31 TO TBL-SUBS.                                        VEGP0106
071050     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
071060     WRITE PRT4  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
071070     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
071080 CK-MIN-TOT14.                                                   VEGP0106
071090     IF RPT14-SWT = 0 GO TO CK-MIN-TOT15.                        VEGP0106
071100     MOVE 0 TO RPT14-SWT.                                        VEGP0106
071110     MOVE 41 TO TBL-SUBS.                                        VEGP0106
071120     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
071130     WRITE PRT5  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
071140     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
071150 CK-MIN-TOT15.                                                   VEGP0106
071160     IF RPT15-SWT = 0 GO TO CK-MIN-TOT16.                        VEGP0106
071170     MOVE 0 TO RPT15-SWT.                                        VEGP0106
071180     MOVE 51 TO TBL-SUBS.                                        VEGP0106
071190     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
071200     WRITE PRT6  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
071210     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
072010 CK-MIN-TOT16.                                                   VEGP0106
072020     IF RPT16-SWT = 0 GO TO CK-MIN-TOT17.                        VEGP0106
072030     MOVE 0 TO RPT16-SWT.                                        VEGP0106
072040     MOVE 61 TO TBL-SUBS.                                        VEGP0106
072050     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
072060     WRITE PRT7  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
072070     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
072080 CK-MIN-TOT17.                                                   VEGP0106
072090     IF RPT17-SWT = 0 GO TO CK-MIN-TOT18.                        VEGP0106
072100     MOVE 0  TO RPT17-SWT.                                       VEGP0106
072110     MOVE 71 TO TBL-SUBS.                                        VEGP0106
072120     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
072130     WRITE PRT8  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
072140     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
072150 CK-MIN-TOT18.                                                   VEGP0106
072160     IF RPT18-SWT = 0 GO TO CK-MIN-TOT19.                        VEGP0106
072170     MOVE 0  TO RPT18-SWT.                                       VEGP0106
072180     MOVE 81 TO TBL-SUBS.                                        VEGP0106
072190     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
072200     WRITE PRT9  FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
072210     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
073010 CK-MIN-TOT19.                                                   VEGP0106
073020     IF RPT19-SWT = 0 GO TO SAV-NEW-MAJ.                         VEGP0106
073030     MOVE 0  TO RPT19-SWT.                                       VEGP0106
073040     MOVE 91 TO TBL-SUBS.                                        VEGP0106
073050     PERFORM GET-TBL-TOTS THRU EXIT-GET-TBL-TOTS.                VEGP0106
073060     WRITE PRT10 FROM WK-PRINT3 AFTER ADVANCING 3 LINES.         VEGP0106
073070     MOVE SPACES TO PRT3-TO-CLR.                                 VEGP0106
073080 SAV-NEW-MAJ.                                                    VEGP0106
073085     IF SORT-REC = '999999' GO TO WRITE-STATS.                    EGP0106
073090     MOVE RDF2 TO SAV-MAJ-LTR.                                   VEGP0106
073100     GO TO MIN-DETAILS.                                          VEGP0106
```

FIGURE A.2, cont.

```
00853   073110 GET-TBL-TOTS.                                              VEGP0106
00854   073120     MOVE 1 TO TENX.                                        VEGP0106
00855   073130 LOOP-BY-10.                                                VEGP0106
00856   073140     IF TENX   10 MOVE OVERALL TO COL-GRND,                 VEGP0106
00857   073150       GO TO EXIT-GET-TBL-TOTS.                             VEGP0106
00858   073160     MOVE TBL-CT (TBL-SUBS) TO COL-TOT (TENX).              VEGP0106
00859   073170     ADD 1 TO TBL-SUBS,  ADD 1 TO TENX.                     VEGP0106
00860   073180     GO TO LOOP-BY-10.                                      VEGP0106
00861   073190 EXIT-GET-TBL-TOTS.  EXIT.                                  VEGP0106
00862
00863   074010 WRITE-STATS.                                               VEGP0106
00864   074020     MOVE SPACES TO STAT-RPT.                               VEGP0106
00865   074030     MOVE BILD-SDATE TO STAT-DATE.                          VEGP0106
00866   074040     MOVE 'WASHINGTON STATE LIBRARY' TO S-COL30-53.         VEGP0106
00867   074050     MOVE 'R0006385' TO S-RPTNO.                            VEGP0106
00868   074060     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 0 LINES.      VEGP0106
00869   074070     MOVE SPACES TO STAT-RPT.                               VEGP0106
00870   074080     MOVE 'OPERATION CONTROL REPORT' TO S-COL30-53.         VEGP0106
00871   074090     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00872   074100     MOVE 'INPUT' TO S-COL10-29.                            VEGP0106
00873   074110     MOVE SPACES TO S-COL30-53.                             VEGP0106
00874   074120     MOVE INRECS  TO CT-COL1.                               VEGP0106
00875   074130     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 2 LINES.      VEGP0106
00876   074140     MOVE '   ACCEPTED' TO S-COL10-29.                      VEGP0106
00877   074150     MOVE SPACES  TO S-COL30-53.                            VEGP0106
00878   074160     MOVE OK-IN   TO CT-COL2.                               VEGP0106
00879   074170     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00880   074180     MOVE '   MISSING LC' TO S-COL10-29.                    VEGP0106
00881   074190     MOVE NG-LC              TO CT-COL2.                    VEGP0106
00882   074200     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00883   074210     MOVE '   MISSING DEWEY' TO S-COL10-29.                 VEGP0106
00884   074220     MOVE NG-DWY                TO CT-COL2.                 VEGP0106
00885   074230     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00886   075010     MOVE '     DUPLICATE LC' TO S-COL10-29.                VEGP0106
00887   075020     MOVE SPACES                 TO S-COL30-53.             VEGP0106
00888   075030     MOVE DUP-LC                 TO CT-COL3.                VEGP0106
00889   075040     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00890   075050     MOVE '     DUPLICATE DEWEY' TO S-COL10-29.             VEGP0106
00891   075060     MOVE DUP-DWY                  TO CT-COL3.              VEGP0106
00892   075070     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 1 LINES.      VEGP0106
00893   075080     MOVE '       END OF REPORT' TO STAT-RPT.               VEGP0106
00894   075090     WRITE PRTO FROM STAT-RPT AFTER ADVANCING 3 LINES.      VEGP0106
00895   075091     CLOSE R0.
00896   075092     CLOSE R1.
00897   075093     CLOSE R2.
00898   075094     CLOSE R3.
00899   075095     CLOSE R4.
00900   075096     CLOSE R5.
00901   075097     CLOSE R6.
00902   075098     CLOSE R7.
00903   075099     CLOSE R8.
00904   075100     CLOSE R9.
00905   075101     CLOSE R10.
00906   075102     CLOSE R11.
00907   075110 EXIT-SECT2.     EXIT.                                      VEGP0106
```

FIGURE A.2, cont.

```
17

INTRNL NAME   LVL SOURCE NAME           BASE    DISPL  INTRNL NAME  DEFINITION  USAGE      R  O  Q
DNM=3-261     FD  BASE-MSTR             DCB=01         DNM=3-261                QSAM
DNM=3-282     01  DATA-BASE             BLI=1     000  DNM=3-282    DS 2508C    DISP
DNM=3-300     FD  CTL-CAPD              DCB=02         DNM=3-300                QSAM
DNM=3-320     01  CTL-INFO              BLI=2     000  DNM=3-320    DS OCL80    GROUP
DNM=3-340     02  IDENT-CTL             BLI=2     000  DNM=3-340    DS 6C       DISP
DNM=3-361     88  GOOD-CTL                             DNM=3-361
DNM=3-385     02  FILLER                BLI=2     006  DNM=3-385    DS 14C      DISP
DNM=3-400     02  TAG1                  BLI=2     014  DNM=3-400    DS 3C       DISP-NM
DNM=3-413     02  FILLER                BLI=2     017  DNM=3-413    DS 3C       DISP
DNM=3-431     02  TAG2                  BLI=2     01A  DNM=3-431    DS 3C       DISP-NM
DNM=3-444     02  FILLER                BLI=2     01D  DNM=3-444    DS 3C       DISP
DNM=3-462     02  TAG3                  BLI=2     020  DNM=3-462    DS 3C       DISP-NM
DNM=3-475     02  FILLER                BLI=2     023  DNM=3-475    DS 3C       DISP
DNM=3-493     02  TAG4                  BLI=2     026  DNM=3-493    DS 3C       DISP-NM
DNM=4-000     02  FILLER                BLI=2     029  DNM=4-000    DS 3C       DISP
DNM=4-018     02  TAG5                  BLI=2     02C  DNM=4-018    DS 3C       DISP-NM
DNM=4-031     02  FILLER                BLI=2     02F  DNM=4-031    DS 33C      DISP
DNM=4-049     FD  R0                    DCB=03         DNM=4-049                QSAM
DNM=4-066     01  PRT0                  BLI=3     000  DNM=4-066    DS 133C     DISP
DNM=4-079     FD  R1                    DCB=04         DNM=4-079                QSAM
DNM=4-096     01  PRT1                  BLI=4     000  DNM=4-096    DS 133C     DISP
DNM=4-112     FD  R2                    DCB=05         DNM=4-112                QSAM
DNM=4-126     01  PRT2                  BLI=5     000  DNM=4-126    DS 133C     DISP
DNM=4-139     FD  R3                    DCB=06         DNM=4-139                QSAM
DNM=4-153     01  PRT3                  BLI=6     000  DNM=4-153    DS 133C     DISP
DNM=4-166     FD  R4                    DCB=07         DNM=4-166                QSAM
DNM=4-180     01  PRT4                  BLI=7     000  DNM=4-180    DS 133C     DISP
DNM=4-193     FD  R5                    DCB=08         DNM=4-193                QSAM
DNM=4-210     01  PRT5                  BLI=8     000  DNM=4-210    DS 133C     DISP
DNM=4-223     FD  R6                    DCB=09         DNM=4-223                QSAM
DNM=4-237     01  PRT6                  BLI=9     000  DNM=4-237    DS 133C     DISP
DNM=4-250     FD  R7                    DCB=10         DNM=4-250                QSAM
DNM=4-264     01  PRT7                  BLI=10    000  DNM=4-264    DS 133C     DISP
DNM=4-277     FD  R8                    DCB=11         DNM=4-277                QSAM
DNM=4-291     01  PRT8                  BLI=11    000  DNM=4-291    DS 133C     DISP
DNM=4-304     FD  R9                    DCB=12         DNM=4-304                QSAM
DNM=4-321     01  PRT9                  BLI=12    000  DNM=4-321    DS 133C     DISP
DNM=4-334     FD  R10                   DCB=13         DNM=4-334                QSAM
DNM=4-349     01  PRT10                 BLI=13    000  DNM=4-349    DS 133C     DISP
DNM=4-363     FD  R11                   DCB=14         DNM=4-363                QSAM
DNM=4-378     01  PRT11                 BLI=14    000  DNM=4-378    DS 133C     DISP
DNM=4-392     SD  SORT-THESE                           DNM=4-392
DNM=4-414     01  REAL-REC              BLL=1     000  DNM=4-414    DS OCL18    GROUP
DNM=4-434     02  PRIME6                BLL=1     000  DNM=4-434    DS 6C       DISP
DNM=4-449     02  FILLER                BLL=1     006  DNM=4-449    DS 12C      DISP

DNM=4-482     77  FILLER                BLI=15    000  DNM=4-482    DS 21C      DISP
DNM=5-000     77  DEWEY-SUBS            BLI=15    016  DNM=5-000    DS 1H       COMP
DNM=5-022     77  SAVE-BASE             BLI=15    018  DNM=5-022    DS 1F       COMP
DNM=5-040     77  DIREC-BMP             BLI=15    01C  DNM=5-040    DS 1H       COMP
DNM=5-058     77  VARI-BMP              BLI=15    020  DNM=5-058    DS 1F       COMP
DNM=5-078     77  PULL-BMP              BLI=15    024  DNM=5-078    DS 1H       COMP
DNM=5-095     77  REC-LOC               BLI=15    026  DNM=5-095    DS 5C       DISP-NM
DNM=5-114     77  TBL-SUBS              BLI=15    02C  DNM=5-114    DS 1H       COMP
DNM=5-131     77  SAV-MAJ-LTR           BLI=15    02E  DNM=5-131    DS 1C       DISP
```

FIGURE A.2, cont.

```
INTRNL NAME     LVL SOURCE NAME                  BASE      DISPL  INTRNL NAME    DEFINITION    USAGE        R  O  Q
DNM=5-151       77  SAV-GRND-TOT                 BLI=15      02F  DNM=5-151      DS 6C         DISP-NM
DNM=5-172       77  1ST-REC                      BLI=15      035  DNM=5-172      DS 1C         DISP-NM
DNM=5-188       77  1ST-MIN                      BLI=15      036  DNM=5-188      DS 1C         DISP-NM
DNM=5-204       77  RPT10-SWT                    BLI=15      037  DNM=5-204      DS 1C         DISP-NM
DNM=5-222       77  RPT11-SWT                    BLI=15      038  DNM=5-222      DS 1C         DISP-NM
DNM=5-240       77  RPT12-SWT                    BLI=15      039  DNM=5-240      DS 1C         DISP-NM
DNM=5-258       77  RPT13-SWT                    BLI=15      03A  DNM=5-258      DS 1C         DISP-NM
DNM=5-276       77  RPT14-SWT                    BLI=15      03B  DNM=5-276      DS 1C         DISP-NM
DNM=5-294       77  RPT15-SWT                    BLI=15      03C  DNM=5-294      DS 1C         DISP-NM
DNM=5-312       77  RPT16-SWT                    BLI=15      03D  DNM=5-312      DS 1C         DISP-NM
DNM=5-330       77  RPT17-SWT                    BLI=15      03E  DNM=5-330      DS 1C         DISP-NM
DNM=5-351       77  RPT18-SWT                    BLI=15      03F  DNM=5-351      DS 1C         DISP-NM
DNM=5-369       77  RPT19-SWT                    BLI=15      040  DNM=5-369      DS 1C         DISP-NM
DNM=5-387       77  TIME                         BLI=15      041  DNM=5-387      DS 8C         DISP-NM
DNM=5-400       77  JDATE                        BLI=15      049  DNM=5-400      DS 5C         DISP-NM
DNM=5-414       77  PAGECT1                      BLI=15      04E  DNM=5-414      DS 3C         DISP-NM
DNM=5-430       77  PAGECT2                      BLI=15      051  DNM=5-430      DS 3C         DISP-NM
DNM=5-446       77  PAGECT3                      BLI=15      054  DNM=5-446      DS 3C         DISP-NM
DNM=5-465       77  PAGECT4                      BLI=15      057  DNM=5-465      DS 3C         DISP-NM
DNM=5-481       77  PAGECT5                      BLI=15      05A  DNM=5-481      DS 3C         DISP-NM
DNM=6-000       77  PAGECT6                      BLI=15      05D  DNM=6-000      DS 3C         DISP-NM
DNM=6-016       77  PAGECT7                      BLI=15      060  DNM=6-016      DS 3C         DISP-NM
DNM=6-035       77  PAGECT8                      BLI=15      063  DNM=6-035      DS 3C         DISP-NM
DNM=6-054       77  PAGECT9                      BLI=15      066  DNM=6-054      DS 3C         DISP-NM
DNM=6-073       77  PAGECT10                     BLI=15      069  DNM=6-073      DS 3C         DISP-NM
DNM=6-093       77  FIRST-RETURN                 BLI=15      06C  DNM=6-093      DS 1C         DISP-NM
DNM=6-114       77  TEMP-REC-CT                  BLI=15      06D  DNM=6-114      DS 5C         DISP-NM
DNM=6-134       77  PRT-SUBS                     BLI=15      072  DNM=6-134      DS 1H         COMP
DNM=6-151       77  OVERALL                      BLI=15      074  DNM=6-151      DS 5C         DISP-NM
DNM=6-170       77  LINE-TOT-SAV                 BLI=15      079  DNM=6-170      DS 6C         DISP-NM
DNM=6-191       77  PCT-RESULT                   BLI=15      07F  DNM=6-191      DS 4C         DISP-NM
DNM=6-210       77  BIG-TOT                      BLI=15      083  DNM=6-210      DS 5C         DISP-NM
DNM=6-229       77  TENX                         BLI=15      088  DNM=6-229      DS 1H         COMP
DNM=6-242       01  WORK-MAST-A                  BLI=15      090  DNM=6-242      DS 0CL2508    GROUP
DNM=6-265       02  LEADER                       BLI=15      090  DNM=6-265      DS 0CL24      GROUP
DNM=6-283       03  TOT-LGTH                     BLI=15      090  DNM=6-283      DS 5C         DISP-NM
DNM=6-300       03  FILLER                       BLI=15      095  DNM=6-300      DS 7C         DISP
DNM=6-318       03  BASE-ADR                     BLI=15      09C  DNM=6-318      DS 5C         DISP-NM
DNM=6-335       03  FILLER                       BLI=15      0A1  DNM=6-335      DS 7C         DISP
DNM=6-353       02  DIRECTORY                    BLI=15      0A8  DNM=6-353      DS 0CL12      GROUP           *
DNM=6-374       03  TAG                          BLI=15      0A8  DNM=6-374      DS 3C         DISP-NM
DNM=6-389       03  LGTH                         BLI=15      0AB  DNM=6-389      DS 4C         DISP-NM
DNM=6-408       03  DISPL                        BLI=15      0AF  DNM=6-408      DS 5C         DISP-NM
DNM=6-425       01  WORK-MAST-B                  BLI=15      090  DNM=6-425      DS 0CL2508    GROUP        *
DNM=6-448       02  REC1                         BLI=15      090  DNM=6-448      DS 1C         DISP            *
DNM=6-461       01  PULLED-VARIES                BLI=15      A60  DNM=6-461      DS 0CL540     GROUP
DNM=6-486       02  VARI-FLD                     BLI=15      A60  DNM=6-486      DS 0CL108     GROUP           *
DNM=7-000       03  VARI-TAG                     BLI=15      A60  DNM=7-000      DS 3C         DISP-NM
DNM=7-020       03  VARI-FLDA                    BLI=15      A64  DNM=7-020      DS 1F         COMP
DNM=7-044       03  VARI-FLDB                    BLI=15      A68  DNM=7-044      DS 0CL100     GROUP
DNM=7-068       04  VARI-FLDC                    BLI=15      A68  DNM=7-068      DS 1C         DISP            *
DNM=7-089       01  CTL-SELECTS                  BLI=15      C80  DNM=7-089      DS 15C        DISP
DNM=7-112       01  SAVE-SELECTS                 BLI=15      C80  DNM=7-112      DS 0CL15      GROUP        *
DNM=7-139       02  SELEC-TAG                    BLI=15      C80  DNM=7-139      DS 3C         DISP-NM         *
DNM=7-157       01  SORT-REC                     BLI=15      C90  DNM=7-157      DS 0CL6       GROUP
```

FIGURE A.2, cont.

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INTRNL NAME    LVL SOURCE NAME                        BASE     DISPL  INTRNL NAME   DEFINITION    USAGE       R  O  Q
DNM=7-177      02  S-POS1                             BLI=15     C90  DNM=7-177     DS 1C         DISP-NM
DNM=7-195      02  S-POS2-3-4                         BLI=15     C91  DNM=7-195     DS 3C         DISP
DNM=7-214      02  S-POS5                             BLI=15     C94  DNM=7-214     DS 1C         DISP-NM
DNM=7-232      02  S-POS6                             BLI=15     C95  DNM=7-232     DS 1C         DISP-NM
DNM=7-250      01  SAVED-SORT                         BLI=15     C98  DNM=7-250     DS 0CL6       GROUP
DNM=7-272      02  PREV1                              BLI=15     C98  DNM=7-272     DS 1C         DISP-NM
DNM=7-286      02  PREV2-3-4                          BLI=15     C99  DNM=7-286     DS 3C         DISP
DNM=7-304      02  PREV-MIN                           BLI=15     C9C  DNM=7-304     DS 1C         DISP-NM
DNM=7-321      02  PREV6                              BLI=15     C9D  DNM=7-321     DS 1C         DISP-NM
DNM=7-338      01  REDEF-SAVED-SORT                   BLI=15     C98  DNM=7-338     DS 0CL6       GROUP       *
DNM=7-366      02  RDF-1                              BLI=15     C98  DNM=7-366     DS 1C         DISP-NM
DNM=7-380      02  RDF-2-3                            BLI=15     C99  DNM=7-380     DS 0CL2       GROUP
DNM=7-399      03  RDF2                               BLI=15     C99  DNM=7-399     DS 1C         DISP
DNM=7-415      03  RDF3                               BLI=15     C9A  DNM=7-415     DS 1C         DISP
DNM=7-428      02  RDF-4-5                            BLI=15     C9B  DNM=7-428     DS 0CL2       GROUP
DNM=7-447      03  RDF4                               BLI=15     C9B  DNM=7-447     DS 1C         DISP-NM
DNM=7-4[illegible]      03  RDF5                               BLI=15     C9C  DNM=7-460     DS 1C         DISP-NM
DNM=7-473      02  RDF-RDF45                          BLI=15     C9B  DNM=7-473     DS 2C         DISP-NM     *
DNM=7-491      02  RDF-6                              BLI=15     C9D  DNM=7-491     DS 1C         DISP-NM
DNM=8-000      01  BILD-OUTREC                        BLI=15     CA0  DNM=8-000     DS 0CL6       GROUP
DNM=8-023      02  POS1                               BLI=15     CA0  DNM=8-023     DS 1C         DISP-NM
DNM=8-036      02  POS2-3                             BLI=15     CA1  DNM=8-036     DS 0CL2       GROUP
DNM=8-057      03  POS2                               BLI=15     CA1  DNM=8-057     DS 1C         DISP
DNM=8-073      03  POS3                               BLI=15     CA2  DNM=8-073     DS 1C         DISP
DNM=8-086      02  POS4-5                             BLI=15     CA3  DNM=8-086     DS 0CL2       GROUP
DNM=8-104      03  POS4                               BLI=15     CA3  DNM=8-104     DS 1C         DISP
DNM=8-117      03  POS5                               BLI=15     CA4  DNM=8-117     DS 1C         DISP
DNM=8-130      02  POS6                               BLI=15     CA5  DNM=8-130     DS 1C         DISP-NM
DNM=8-143      01  LC-HOLD                            BLI=15     CA8  DNM=8-143     DS 0CL2       GROUP
DNM=8-165      02  MAJ-LTR                            BLI=15     CA8  DNM=8-165     DS 1C         DISP
DNM=8-181      02  MIN-LTR                            BLI=15     CA9  DNM=8-181     DS 1C         DISP
DNM=8-197      01  DEWEY-HOLD                         BLI=15     CB0  DNM=8-197     DS 0CL2       GROUP
DNM=8-219      02  MAJ-NUM                            BLI=15     CB0  DNM=8-219     DS 1C         DISP-NM
DNM=8-235      02  MIN-NUM                            BLI=15     CB1  DNM=8-235     DS 1C         DISP-NM
DNM=8-251      01  REDEF-DEWEY-HOLD                   BLI=15     CB0  DNM=8-251     DS 0CL2       GROUP       *
DNM=8-279      02  MAJ-AN                             BLI=15     CB0  DNM=8-279     DS 1C         DISP
DNM=8-294      02  MIN-AN                             BLI=15     CB1  DNM=8-294     DS 1C         DISP
DNM=8-309      01  DEWEY-NUMBER                       BLI=15     CB0  DNM=8-309     DS 2C         DISP-NM     *
DNM=8-330      01  TBL-NUM-CTS                        BLI=15     CB8  DNM=8-330     DS 500C       DISP
DNM=8-350      01  R-TBL-NUM-CTS                      BLI=15     CB8  DNM=8-350     DS 0CL500     GROUP       *
DNM=8-375      02  TBL-CT                             BLI=15     CB8  DNM=8-375     DS 5C         DISP-NM        *
DNM=8-390      01  TABLE-GROUPS                       BLI=15     CB8  DNM=8-390     DS 0CL500     GROUP       *
DNM=8-414      02  GRP-OF-10                          BLI=15     CB8  DNM=8-414     DS 0CL50      GROUP          *
DNM=8-435      03  G0                                 BLI=15     CB8  DNM=8-435     DS 5C         DISP-NM
DNM=8-449      03  G1                                 BLI=15     CBD  DNM=8-449     DS 5C         DISP-NM
DNM=8-463      03  G2                                 BLI=15     CC2  DNM=8-463     DS 5C         DISP-NM
DNM=8-477      03  G3                                 BLI=15     CC7  DNM=8-477     DS 5C         DISP-NM
DNM=8-491      03  G4                                 BLI=15     CCC  DNM=8-491     DS 5C         DISP-NM
DNM=9-000      03  G5                                 BLI=15     CD1  DNM=9-000     DS 5C         DISP-NM
DNM=9-017      03  G6                                 BLI=15     CD6  DNM=9-017     DS 5C         DISP-NM
DNM=9-034      03  G7                                 BLI=15     CDB  DNM=9-034     DS 5C         DISP-NM
DNM=9-048      03  G8                                 BLI=15     CE0  DNM=9-048     DS 5C         DISP-NM
DNM=9-065      03  G9                                 BLI=15     CE5  DNM=9-065     DS 5C         DISP-NM
DNM=9-082      01  STAT-CTS                           BLI=15     EB0  DNM=9-082     DS 0CL36      GROUP
DNM=9-105      02  INRECS                             BLI=15     EB0  DNM=9-105     DS 6C         DISP-NM
```

FIGURE A.2, cont.

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INTRNL NAME    LVL SOURCE NAME                BASE    DISPL  INTRNL NAME    DEFINITION    USAGE       R  O  Q
DNM=9-120      02  OK-IN                      BLI=15    EB6  DNM=9-120      DS 6C         DISP-NM
DNM=9-134      02  NG-LC                      BLI=15    EBC  DNM=9-134      DS 6C         DISP-NM
DNM=9-151      02  NG-DWY                     BLI=15    EC2  DNM=9-151      DS 6C         DISP-NM
DNM=9-166      02  DUP-LC                     BLI=15    EC8  DNM=9-166      DS 6C         DISP-NM
DNM=9-181      02  DUP-DWY                    BLI=15    ECE  DNM=9-181      DS 6C         DISP-NM
DNM=9-200      01  HEAD1                      BLI=15    ED8  DNM=9-200      DS 0CL134     GROUP
DNM=9-217      02  MAJ-MIN                    BLI=15    ED8  DNM=9-217      DS 8C         DISP
DNM=9-233      02  FILLER                     BLI=15    EE0  DNM=9-233      DS 8C         DISP
DNM=9-251      02  HD15                       BLI=15    EE8  DNM=9-251      DS 1C         DISP
DNM=9-264      02  HD16                       BLI=15    EE9  DNM=9-264      DS 1C         DISP
DNM=9-277      02  FILLER                     BLI=15    EEA  DNM=9-277      DS 38C        DISP
DNM=9-295      02  FILLER                     BLI=15    F10  DNM=9-295      DS 70C        DISP
DNM=9-313      02  FILLER                     BLI=15    F56  DNM=9-313      DS 1C         DISP
DNM=9-331      02  RPTNO                      BLI=15    F57  DNM=9-331      DS 2C         DISP-NM
DNM=9-345      02  FILLER                     BLI=15    F59  DNM=9-345      DS 5C         DISP
DNM=9-363      01  HEAD2                      BLI=15    F60  DNM=9-363      DS 0CL133     GROUP
DNM=9-383      02  FILLER                     BLI=15    F60  DNM=9-383      DS 2C         DISP
DNM=9-401      02  RPTMO                      BLI=15    F62  DNM=9-401      DS 2C         RPT
DNM=9-425      02  FILLER                     BLI=15    F64  DNM=9-425      DS 1C         DISP
DNM=9-443      02  RPTDY                      BLI=15    F65  DNM=9-443      DS 2C         RPT
DNM=9-464      02  FILLER                     BLI=15    F67  DNM=9-464      DS 1C         DISP
DNM=9-482      02  RPTYR                      BLI=15    F68  DNM=9-482      DS 2C         DISP-NM
DNM=10-000     02  FILLER                     BLI=15    F6A  DNM=10-000     DS 23C        DISP
DNM=10-018     02  FILLER                     BLI=15    F81  DNM=10-018     DS 92C        DISP
DNM=10-036     02  FILLER                     BLI=15    FDD  DNM=10-036     DS 5C         DISP
DNM=10-054     02  PAGENUM                    BLI=15    FE2  DNM=10-054     DS 3C         RPT
DNM=10-077     01  HEAD3                      BLI=15    FE8  DNM=10-077     DS 0CL133     GROUP
DNM=10-097     02  FILLER                     BLI=15    FE8  DNM=10-097     DS 96C        DISP
DNM=10-115     02  FILLER                     BLI=16    048  DNM=10-115     DS 37C        DISP
DNM=10-133     01  WK-PRT1-PARTIAL            BLI=16    070  DNM=10-133     DS 0CL133     GROUP
DNM=10-163     02  WITHOUT-TOT                BLI=16    070  DNM=10-163     DS 127C       DISP
DNM=10-183     02  FILLER                     BLI=16    0EF  DNM=10-183     DS 6C         DISP
DNM=10-201     01  WK-PRINT1                  BLI=16    070  DNM=10-201     DS 0CL133     GROUP       *
DNM=10-225     02  FILLER                     BLI=16    070  DNM=10-225     DS 4C         DISP
DNM=10-243     02  LC-X                       BLI=16    074  DNM=10-243     DS 3C         DISP
DNM=10-259     02  DTL-COL-1                  BLI=16    077  DNM=10-259     DS 0CL12      GROUP          *
DNM=10-283     03  TOT-PART                   BLI=16    077  DNM=10-283     DS 5C         RPT
DNM=10-308     03  PCT-PART-1                 BLI=16    07C  DNM=10-308     DS 5C         RPT
DNM=10-342     03  PCT-CHAR-1                 BLI=16    081  DNM=10-342     DS 2C         DISP
DNM=10-367     02  LINE-TOT                   BLI=16    0EF  DNM=10-367     DS 6C         RPT
DNM=10-389     01  WK-PRINT2                  BLI=16    0F8  DNM=10-389     DS 0CL133     GROUP
DNM=10-413     02  FILLER                     BLI=16    0F8  DNM=10-413     DS 12C        DISP
DNM=10-431     02  DTL-COL-2                  BLI=16    104  DNM=10-431     DS 0CL12      GROUP          *
DNM=10-455     03  PCT-PART-2                 BLI=16    104  DNM=10-455     DS 5C         RPT
DNM=10-486     03  PCT-CHAR-2                 BLI=16    109  DNM=10-486     DS 7C         DISP
DNM=11-000     02  FILLER                     BLI=16    17C  DNM=11-000     DS 1C         DISP
DNM=11-018     01  WK-PRINT3                  BLI=16    180  DNM=11-018     DS 0CL133     GROUP
DNM=11-042     02  FILLER                     BLI=16    180  DNM=11-042     DS 7C         DISP
DNM=11-060     02  PRT3-TO-CLR                BLI=16    187  DNM=11-060     DS 0CL126     GROUP
DNM=11-083     03  COL-TOTS                   BLI=16    187  DNM=11-083     DS 0CL12      GROUP          *
DNM=11-103     04  COL-TOT                    BLI=16    187  DNM=11-103     DS 5C         RPT
DNM=11-127     04  FILLER                     BLI=16    18C  DNM=11-127     DS 7C         DISP
DNM=11-148     03  COL-GRND                   BLI=16    1FF  DNM=11-148     DS 6C         RPT
DNM=11-173     01  STAT-RPT                   BLI=16    208  DNM=11-173     DS 0CL82      GROUP
DNM=11-193     02  FILLER                     BLI=16    208  DNM=11-193     DS 2C         DISP
```

FIGURE A.2, cont.

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INTRNL NAME    LVL SOURCE NAME                    BASE     DISPL  INTRNL NAME    DEFINITION     USAGE       R  O  Q
DNM=11-211     02  STAT-DATE                      BLI=16    20A   DNM=11-211     DS 8C          DISP
DNM=11-232     02  S-COL10-29                     BLI=16    212   DNM=11-232     DS 20C         DISP
DNM=11-254     02  S-COL30-53                     BLI=16    226   DNM=11-254     DS OCL24       GROUP
DNM=11-279     03  CT-COL1                        BLI=16    226   DNM=11-279     DS 6C          RPT
DNM=11-303     03  FILLER                         BLI=16    22C   DNM=11-303     DS 1C          DISP
DNM=11-321     03  CT-COL2                        BLI=16    22D   DNM=11-321     DS 6C          RPT
DNM=11-345     03  FILLER                         BLI=16    233   DNM=11-345     DS 2C          DISP
DNM=11-363     03  CT-COL3                        BLI=16    235   DNM=11-363     DS 6C          RPT
DNM=11-387     03  FILLER                         BLI=16    23B   DNM=11-387     DS 3C          DISP
DNM=11-405     02  FILLER                         BLI=16    23E   DNM=11-405     DS 20C         DISP
DNM=11-423     02  S-RPTNO                        BLI=16    252   DNM=11-423     DS 8C          DISP
DNM=11-442     01  BILD-SDATE                     BLI=16    260   DNM=11-442     DS OCL8        GROUP
DNM=11-467     02  STAT-MO                        BLI=16    260   DNM=11-467     DS 2C          RPT
DNM=11-490     02  FILLER                         BLI=16    262   DNM=11-490     DS 1C          DISP
DNM=12-000     02  STAT-DY                        BLI=16    263   DNM=12-000     DS 2C          RPT
DNM=12-023     02  FILLER                         BLI=16    265   DNM=12-023     DS 1C          DISP
DNM=12-041     02  STAT-YR                        BLI=16    266   DNM=12-041     DS 2C          DISP-NM
DNM=12-057     01  STDATE                         BLI=16    268   DNM=12-057     DS 6C          DISP-NM
DNM=12-072     01  REDEF-STDATE                   BLI=16    268   DNM=12-072     DS OCL6        GROUP       *
DNM=12-099     02  ST-YR                          BLI=16    268   DNM=12-099     DS 2C          DISP-NM
DNM=12-113     02  ST-MO                          BLI=16    26A   DNM=12-113     DS 2C          DISP-NM
DNM=12-127     02  ST-DY                          BLI=16    26C   DNM=12-127     DS 2C          DISP-NM
```

A.3 Book Holdings by Subjects

Tables A.4, A.5, and A.6 provide a general picture of relative subject strength. Titles rather than volumes are shown because of the wide variation in volume to title ratios exhibited in the libraries included in the study. For example, for the collections of King County, University of Washington and the Washington State Library, the estimated volume to title ratios are approximately 8.3 to 1, 2.4 to 1, and 1.4 to 1, respectively. While variations of this order are warranted on the basis of differing clientele and service patterns, a rendering of holdings by volumes can produce a distortion of relative subject strength.

Table A.7 shows the subject analysis of the title holdings of the ten largest libraries. In this table all L.C. classified collections have been translated into Dewey classes to facilitate comparison. This was accomplished using the techniques and tables presented in section A.2.2.

TABLE A.4
ADULT ONLY (INCLUDING ALL DEWEY HOLDINGS OF STATE LIBRARY AND ACADEMIC LIBRARIES)
BOOK HOLDINGS CLASSIFIED IN DEWEY (CIRCA JANUARY 1970)

LIBRARY	000's		100's		200's		300's		400's		500's		600's	
	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.
State Library	5,560	3.81	6,130	4.20	4,860	3.33	36,560	25.03	1,780	1.22	9,610	6.58	30,290	20.74
Seattle	7,784	2.18	10,298	2.89	11,141	3.13	59,135	16.60	4,221	1.18	27,439 (1)	7.70	52,148	14.64
Spokane Public	3,327	2.63	2,201	1.74	3,078	2.43	14,103	11.15	1,165	.92	5,249	4.15	14,093	11.14
Tacoma	2,340	1.95	2,823	2.35	3,403	2.83	17,052	14.25	1,375	1.14	6,263	5.23	13,968	11.67
King County	1,257	1.55	2,060	2.54	1,857	2.29	8,133	10.01	619	.76	4,477	5.51	7,107	8.75
Everett	1,030	1.27	1,716	2.11	2,621	3.23	8,642	10.65	593	.73	2,860	3.52	8,247	10.16
Yakima Valley	509	.68	1,450	1.93	2,016	2.69	7,757	10.35	739	.99	3,082	4.11	7,142	9.53
Bellingham	635	.88	1,362	1.88	1,949	2.70	6,502	8.99	484	.67	3,447	4.77	7,701	10.65
Fort Vancouver Regional	860	1.46	1,331	2.26	1,699	2.89	7,298	12.41	594	1.01	2,641	4.49	6,264	10.65
Richland	711	1.36	1,122	2.15	1,477	2.83	6,863	13.17	374	.72	2,712	5.20	5,124	9.83
Longview	545	1.07	946	1.86	1,808	3.55	5,848	11.48	354	.70	2,414	4.74	4,929	9.68
Pierce County	247	.52	922	1.95	1,207	2.55	5,140	10.88	399	.84	2,147	4.54	5,064	10.72
Kitsap County	256	.57	1,025	2.27	1,175	2.60	4,325	9.57	325	.72	1,965	4.35	5,535	12.25
Sno-Isle Regional	425	.96	673	1.52	620	1.40	2,761	6.24	248	.56	1,451	3.28	4,089	9.25
Whatcom County	302	.69	594	1.36	885	2.03	3,091	7.09	202	.46	1,814	4.16	4,390	10.07
Mid-Columbia Regional	597	1.41	766	1.81	866	2.05	4,975	11.76	507	1.20	2,020	4.78	4,826	11.41
Puyallup	146	.64	546	2.40	501	2.21	2,038	8.98	155	.68	1,074	4.73	2,339	10.30
University of Washington	13,303	2.31	20,175	3.50	13,208	2.29	117,418	20.36	12,028	2.09	61,772	10.71	90,673	15.72
Washington State Univ.	2,961	1.65	5,049	2.82	6,189	3.46	37,947	21.19	3,511	1.96	15,387	8.59	26,908	15.02
East. Wash. State Coll.	1,574	2.08	3,544	4.70	1,610	2.14	19,741	25.72	1,178	1.54	5,866	7.44	6,770	8.49
West. Wash. State Coll.	649	1.40	3,327	7.17	1,246	2.69	14,842	31.99	340	.73	4,398	9.48	3,986	8.59
Everett Community Coll.	296	1.28	1,003	4.32	382	1.65	3,992	17.20	363	1.56	2,875	12.39	3,132	13.50
Yakima Valley Comm. Coll.	245	1.20	980	4.81	421	2.07	4,135	20.29	216	1.06	2,018	9.90	2,038	10.00
Green River Comm. Coll.	385	2.17	925	5.21	424	2.39	3,996	22.52	144	.81	2,022	11.39	1,531	8.63
Centralia Comm. Coll.	207	1.39	780	5.24	302	2.03	2,636	17.71	179	1.20	2,102	14.12	1,445	9.71

(1) Includes Aeronautics, usually classed in 600's
(2) Includes considerable fiction
(3) Fiction included
(4) Biography included

TABLE A.4, cont.
ADULT ONLY (INCLUDING ALL DEWEY HOLDINGS OF STATE LIBRARY AND ACADEMIC LIBRARIES
BOOK HOLDINGS CLASSIFIED IN DEWEY (CIRCA JANUARY 1970)

LIBRARY	700's		800's		900's		BIOGRAPHY (B,920's)		FICTION		TOTAL NO. OF TITLES
	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	
State Library	15,810	10.82	11,920	8.16	11,240	7.69	7,830	5.36	4,480	3.07	146,070
Seattle	50,584	14.20	27,984	7.85	45,732	12.84	26,703	7.49	33,131	9.30	356,300
Spokane Public	13,735	10.86	10,717	8.47	20,856	16.49	7,968	6.30	29,990	23.71	126,482
Tacoma	16,792	14.15	11,509	9.61	18,211	15.20	7,437	6.21	18,449	15.41	119,621
King County	9,109	11.21	6,682	8.23	10,598	13.05	6,672	8.21	22,657	27.89	81,228
Everett	8,299	10.23	6,812	8.39	12,262	15.11	5,699	7.02	22,370	27.57	81,151
Yakima Valley	7,008	9.35	7,757	10.35	9,908	13.22	4,819	6.43	22,771	30.38	74,957
Bellingham	6,099	8.44	7,666	10.60	10,582	14.64	6,260	8.66	19,614	27.13	72,301
Fort Vancouver Regional	5,947	10.11	5,118	8.70	8,875	15.09	3,787	6.44	14,412	24.50	58,826
Richland	5,133	9.85	3,590	6.89	7,237	13.89	3,375	6.48	14,399	27.63	52,117
Longview	3,848	7.56	4,313	8.47	7,383	14.50	4,979	9.78	13,554	26.62	50,921
Pierce County	5,444	11.52	3,553	7.52	6,792	14.38	2,917	6.17	13,414	28.39	47,247
Kitsap County	4,870	10.78	3,327	7.36	6,649	14.71	3,508	7.76	12,228	27.06	45,188
Sno-Isle Regional	3,912	8.85	2,407	5.44	5,876	13.29	2,513	5.68	19,240	43.51	44,215
Whatcom County	3,315	7.60	2,016	4.62	5,880	13.49	3,125	7.17	17,976	41.24	43,590
Mid-Columbia Regional	4,885	11.55	2,338	5.53	6,458	15.27	2,577	6.09	11,880	28.09	42,297
Puyallup	1,838	8.10	3,576 (2)	15.75	2,912	12.83	1,811	7.98	5,769	25.41	22,705
University of Washington	40,099	6.95	112,479 (3)	19.50	70,806	12.08	24,765	4.49	--	--	576,735
Washington State Univ.	11,234	6.27	40,832 (3)	22.80	26,158	14.60	2,944	1.64	--	--	179,120
East. Wash. State Coll.	6,079	8.07	11,465 (3)	15.22	12,690	16.85	5,755	7.64	--	---	75,272
West. Wash. State Coll.	3,687	7.95	7,303 (3)	15.74	6,623 (4)	14.26	--	--	--	--	46,401
Everett Community Coll.	2,063	8.89	3,428	14.77	3,428	14.77	974	4.20	1,270	5.47	23,206
Yakima Valley Comm. Coll.	1,274	6.25	5,302 (3)	26.01	2,646	12.98	1,107	5.43	--	--	20,382
Green River Comm. Coll.	1,233	6.95	3,236 (3)	18.23	3,852 (4)	21.70	--	--	--	--	17,748
Centralia Comm. Coll.	1,413	9.49	1,992	13.38	2,819 (4)	18.94	--	--	997	6.70	14,872

TABLE A.5

BOOK HOLDINGS CLASSIFIED IN DEWEY (CIRCA JANUARY 1970)

JUVENILE ONLY

LIBRARY	000's		100's		200's		300's		400's		500's		600's		700's		800's		900's		BIOGRAPHY		FICTION		TOTAL NO. OF TITLES
	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	
Seattle	209	.67	198	.63	384	1.22	2,127	6.78	188	.60	2,697	8.60	1,919	6.12	2,675	8.53	768	2.45	3,838	12.23	1,919	6.12	14,455	46.05	31,377
Spokane Public	956	1.75	647	1.19	896	1.64	4,094	7.51	339	.62	1,514	2.78	4,094	7.51	3,984	7.30	3,108	5.70	6,056	11.10	2,331	4.27	26,523	48.63	54,541
Tacoma	290	.97	45	.15	327	1.09	1,753	5.85	186	.62	2,236	7.46	1,865	6.22	2,006	6.69	854	2.85	3,158	10.54	1,664	5.55	15,581	52.01	29,965
King County	74	.39	28	.15	177	.92	1,051	5.49	84	.44	1,451	7.57	763	3.98	1,256	6.56	353	1.84	1,302	6.80	1,023	5.34	11,597	60.53	19,159
Everett	83	.36	21	.09	208	.91	1,612	7.08	114	.50	1,664	7.31	957	4.20	884	3.88	874	3.84	2,382	10.46	1,310	5.75	12,667	55.62	22,776
Yakima Valley	58	.22	29	.11	259	.97	1,584	5.95	86	.32	2,189	8.22	1,517	5.70	1,459	5.48	758	2.85	2,074	7.79	1,354	5.08	15,264	57.31	26,631
Bellingham	96	.58	11	.07	192	1.17	1,321	8.02	213	1.29	1,375	8.35	885	5.37	800	4.86	511	3.10	1,524	9.25	1,055	6.41	8,485	51.52	16,468
Fort Vancouver Regional	102	.50	31	.15	184	.89	1,464	7.11	174	.84	1,638	7.95	1,003	4.87	819	3.98	420	2.04	1,699	8.25	911	4.42	12,150	58.99	20,595
Richland	19	.09	75	.36	318	1.51	1,487	7.08	75	.36	1,879	8.95	1,103	5.25	954	4.54	458	2.18	2,085	9.93	1,178	5.61	11,370	54.14	21,001
Longview	61	.48	20	.16	141	1.11	960	7.56	81	.64	1,222	9.63	818	6.44	505	3.98	414	3.26	1,414	11.14	909	7.16	6,151	48.45	12,696
Pierce County	48	.25	19	.10	152	.80	1,102	5.78	152	.80	1,397	7.32	1,045	5.48	1,159	6.08	399	2.09	2,727	14.29	1,159	6.08	9,719	50.94	19,078
Kitsap County	39	.28	11	.08	106	.76	697	4.99	114	.82	769	5.50	951	6.81	507	3.63	269	1.93	1,023	7.32	730	5.22	8,756	62.67	13,972
Sno-Isle Regional	195	.65	53	.18	212	.70	1,540	5.09	159	.53	1,982	6.56	1,487	4.92	1,310	4.33	460	1.52	2,053	6.79	1,788	5.91	18,992	62.82	30,232
Whatcom County	22	.24	11	.12	112	1.22	896	9.73	78	.85	1,064	11.56	661	7.18	538	5.84	269	2.92	974	10.58	538	5.84	4,043	43.92	9,206
Mid-Columbia Regional	40	.16	50	.20	269	1.06	1,502	5.94	119	.47	2,109	8.34	1,353	5.35	965	3.82	448	1.77	2,428	9.60	1,572	6.22	14,437	57.08	25,293
Puyallup	82	.56	291	1.97	264	1.79	1,092	7.39	82	.56	573	3.88	1,256	8.50	992	6.72	1,920	13.00	1,565	10.60	974	6.59	5,678	38.45	14,769

TABLE A.6

BOOK HOLDINGS CLASSIFIED IN L.C. (CIRCA JANUARY 1970)

LIBRARY	A		B		C		D		E		F		G		H		J		K		L	
	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.
University of Washington	800	.60	7,612	5.75	888	.67	13,123	9.91	1,158	.87	3,992	3.01	3,412	2.61	16,278	12.79	4,425	3.34	825	.62	2,925	2.96
Washington State Univ.	2,462	2.37	5,444	5.24	944	.91	7,614	7.33	5,203	5.01	4,982	4.79	3,976	3.83	11,463	11.03	3,327	3.20	332	.32	3,771	3.63
East. Wash. State Coll.	23	.19	429	3.55	66	.55	644	5.32	1,079	8.92	2,336	19.37	388	3.21	1,056	8.73	189	1.56	64	.53	599	4.95
Cent. Wash. State Coll.	1,063	.97	7,196	6.54	585	.53	8,948	8.13	4,116	3.74	3,364	3.06	2,948	2.68	14,541	13.22	3,629	3.30	744	.68	9,585	8.71
West. Wash. State Coll.	405	.55	4,608	6.26	603	.82	6,822	9.27	3,069	4.17	1,772	2.41	2,673	3.63	7,983	10.84	2,448	3.33	229	.31	3,591	4.88
Seattle Comm. Coll.	38	.17	925	4.21	304	1.28	2,285	10.40	2,034	9.16	1,123	5.11	712	3.24	2,205	10.04	911	4.13	238	1.08	554	2.52

LIBRARY	M		N		P		Q		R		S		T		U		V		Z		TOTAL NO. OF TITLES
	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	TITLES	PCT.	
University of Washington	5,537	4.18	5,988	4.52	30,999	24.41	19,462(1)	14.90	-(1)	--	2,375	1.89	6,763	4.65	500	.38	250	.19	4,700	3.75	132,409
Washington State Univ.	2,991	2.88	3,348	3.22	19,387	18.65	13,916	13.39	3,932	3.78	3,031	2.92	4,268	4.11	507	.49	154	.15	2,880	2.74	103,932
East. Wash. State Coll.	215	1.78	227	1.88	2,062	17.35	1,757	14.83	231	1.91	96	.79	271	2.24	31	.25	10	.08	243	2.01	12,096
Cent. Wash. State Coll.	3,868	3.52	4,479	4.07	22,479	20.44	11,798	10.73	2,373	2.16	718	.65	3,497	3.18	231	.21	50	.05	3,789	3.43	110,001
West. Wash. State Coll.	1,197	1.63	2,592	3.52	19,422	26.38	7,551	10.25	1,224	1.66	513	.70	1,953	2.65	423	.57	99	.13	4,437	6.04	73,615
Seattle Comm. Coll.	316	1.34	1,162	5.29	4,663	20.98	2,469	11.22	370	1.69	252	1.15	1,189	5.31	132	.60	80	.36	158	.72	22,120

(1) Q includes Medicine, usually classed in R.

TABLE A.7

BOOK HOLDINGS OF THE LARGEST LIBRARIES
ADULT ONLY -- LC CLASSED TITLES HAVE BEEN TRANSLATED TO DDC

Library	000's	100's	200's	300's	400's	500's	600's	700's	800's	900's	Biog (B,920)	Fiction	Total Titles
University of Washington	18.875	23,016	18,384	146,187	14,178	80,228	103,036	55,292	137,730[1]	82,842[2]	28,973[2]	--	708,741
Seattle Public Library	7,784	10,298	11.141	59,135	4,221	27,439[3]	52,148	50,584	27,984	45,732	26,703	33,131	356,300
Wash. State University	7,345	7,235	10,012	62,904	4,929	29,165	39,685	21,050	56,739[1]	39,580[2]	4,455[2]	--	283,099
Washington State Library	5,560	6,130	4,860	36,560	1,780	9,610	30,290	15,810	11,920	11,240	7,830	4,480[4]	146,070
Spokane Public Library	3,327	2,201	3,078	14,103	1,165	5,249	14,093	13,735	10,717	20,856	7,968	29,990	126,482
Western Washington St. Coll.	5,237	5,042	4,416	32,501	1,707	11,885	9,718	9,927	23,113[1]	16,472[5]	--	--	120,018
Tacoma Public Library	2,340	2,823	3,403	17.052	1,375	6,263	13,968	16,792	11,509	18,211	7,437	18,449	119,622
Central Washington St. Coll.	4,628	2,728	4,941	31,966	1.664	11,454	9,540	11,102	18,395[1]	13,545[5]	--	--	109,963
Eastern Washington St. Coll.	1,892	3,726	1,936	22,650	1,328	7,489	7,665	6,859	13,152[1]	14,850	6,735	--	88,282
King County Regional Lib.	1,257	2,060	1,857	8,133	619	4,477	7,107	9,109	6,682	10,598	6,672	22,657	81,228

1. Includes Fiction.
2. Biography vs. 900's reflects DDC proportions.
3. Includes Aeronautics, usually classed in 600's.
4. Purchase of Fiction is a rarity.
5. Biography included.

A.4 Age of Book Collections

Table A.8 shows the age of two book collections, Seattle Public Library and Washington State Library, by subject classification group.

In both cases extensive samples were drawn from the shelf lists of the libraries and then were analyzed with regard to both subject and age.

AGE OF BOOK COLLECTION -- SEATTLE PUBLIC LIBRARY & WASHINGTON STATE LIBRARY

JANUARY 1970

TABLE A.8

SUBJECT	000's				100's				200's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. COLL.	3.81		2.18		4.20		2.89		3.33		3.13	
MEDIAN AGE	1961		1954		1960		1954		1960		1950	
90% YEAR	1934		1910		1927		1918		1930		1911	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	3.50		3.57		2.36		2.86		3.24		2.63	
1968	10.20	13.70	3.57	7.14	2.69	5.05	20.00	22.86	3.24	6.48	0.00	2.63
1967	11.08	24.78	3.57	10.71	5.72	10.77	5.71	28.57	2.88	9.36	5.26	7.89
1966	7.58	32.36	0.00	10.71	7.41	18.18	2.86	31.43	3.96	13.32	0.00	7.89
1965	4.08	36.44	14.29	25.00	5.72	23.90	2.86	34.29	4.32	17.64	13.16	21.05
1964	2.62	39.06	3.57	28.57	5.05	28.95	0.00	34.29	7.55	25.19	2.63	23.68
1963	4.37	43.43	3.57	32.14	6.40	35.35	2.86	37.15	9.35	34.54	0.00	23.68
1962	4.37	47.80	0.00	32.14	6.40	41.75	0.00	37.15	5.40	39.94	5.26	28.94
1961	4.37	52.17	7.14	39.28	7.41	49.16	0.00	37.15	5.76	45.70	2.63	31.57
1960	3.21	55.38	0.00	39.28	3.03	52.19	2.86	40.01	7.55	53.25	0.00	31.57
1959	2.92	58.30	0.00	39.28	3.70	55.89	2.86	42.87	5.40	58.65	2.63	34.20
1958	1.17	59.47	3.57	42.85	1.68	57.57	0.00	42.87	3.60	62.25	7.89	42.09
1957	2.62	62.09	0.00	42.85	3.03	60.60	0.00	42.87	3.24	65.49	0.00	42.09
1956	2.04	64.13	3.57	46.42	3.37	63.97	8.57	51.44	4.32	69.81	2.63	44.72
1955	2.92	67.05	0.00	46.42	3.37	67.34	0.00	51.44	1.44	71.25	0.00	44.72
1954	1.46	68.51	3.57	49.99	3.37	70.71	0.00	51.44	1.08	72.33	0.00	44.72
1953	1.75	70.26	3.57	53.56	2.02	72.73	2.86	54.30	2.88	75.21	2.63	47.35
1952	1.75	72.01	0.00	53.56	3.37	76.10	0.00	54.30	1.08	76.29	0.00	47.35
1951	1.17	73.18	0.00	53.56	1.01	77.11	0.00	54.30	1.08	77.37	5.26	52.60
1950	2.33	75.51	3.57	57.13	2.02	79.13	2.86	57.16	2.52	79.89	0.00	52.60
Before 1950	24.49	100.00	42.87	100.00	20.87	100.00	42.84	100.00	20.11	100.00	47.40	100.00

AGE OF BOOK COLLECTION -- SEATTLE PUBLIC LIBRARY & WASHINGTON STATE LIBRARY

(continued)

TABLE A.8, cont.

SUBJECT	300's				400's				500's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. COLL.	25.03		16.60		1.22		1.18		6.58		7.70	
MEDIAN AGE	1964		1956		1958		1958		1963		1951	
90% YEAR	1949		1914		1918		1913		1945		1913	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	7.55		6.29		2.13		0.00		7.77		2.33	
1968	10.79	18.34	6.92	13.21	3.90	6.03	15.38	15.38	15.19	22.96	4.65	6.98
1967	14.75	33.09	5.66	18.87	8.51	14.54	0.00	15.38	10.25	33.21	2.33	9.31
1966	6.83	39.92	8.81	27.68	6.52	21.06	0.00	15.38	4.59	37.80	1.16	10.47
1965	6.83	46.75	3.14	30.82	2.48	23.54	23.08	38.46	3.89	41.69	1.16	11.63
1964	3.96	50.71	1.89	32.71	6.52	30.06	7.69	46.15	6.36	48.05	1.16	12.79
1963	5.76	56.47	2.52	35.23	6.52	36.58	0.00	46.15	3.18	51.23	4.65	17.44
1962	5.03	61.50	3.14	38.37	4.26	40.84	0.00	46.15	2.12	53.35	0.00	17.44
1961	3.24	64.74	1.89	40.26	4.26	45.10	0.00	46.15	2.83	56.18	1.16	18.60
1960	5.76	70.50	1.26	41.52	3.55	48.65	0.00	46.15	6.01	62.19	8.14	26.74
1959	2.52	73.02	3.14	44.66	4.26	52.91	0.00	46.15	4.59	66.78	2.33	29.07
1958	2.88	75.90	3.77	48.43	2.84	55.75	7.69	53.84	2.83	69.61	3.49	32.56
1957	2.16	78.06	0.63	49.06	1.42	57.17	0.00	53.84	3.18	72.79	2.33	34.89
1956	2.52	80.58	2.52	51.58	3.19	60.36	0.00	53.84	1.41	74.20	2.33	37.22
1955	2.52	83.10	0.63	52.21	3.55	63.91	0.00	53.84	2.47	76.67	3.49	40.71
1954	.72	83.82	1.26	53.47	1.06	64.97	0.00	53.84	1.41	78.08	1.16	41.87
1953	1.08	84.90	0.63	54.10	1.42	66.39	0.00	53.84	2.47	80.55	2.33	44.20
1952	1.80	86.70	0.00	54.10	1.42	67.81	0.00	53.84	.71	81.26	5.81	50.01
1951	1.08	87.78	0.63	54.73	1.42	69.23	0.00	53.84	1.41	82.67	0.00	50.01
1950	1.08	88.86	1.26	55.99	1.42	70.65	0.00	53.84	1.06	83.73	2.33	52.34
Before 1950	11.14	100.00	44.01	100.00	29.35	100.00	46.16	100.00	16.27	100.00	47.66	100.00

TABLE A.8, cont.

AGE OF BOOK COLLECTION -- SEATTLE PUBLIC LIBRARY & WASHINGTON STATE LIBRARY

(continued)

SUBJECT	600's				700's				800's				900's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. COLL.	20.74		14.64		10.82		14.20		8.16		7.85		7.69		12.84	
MEDIAN AGE	1963		1951		1962		1954		1960		1947		1962		1951	
90% YEAR	1946		1917		1938		1925		1919		1901		1924		1900	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	7.72		5.11		7.14		2.90		4.84		2.56		9.93		2.82	
1968	10.18	17.90	5.84	10.95	15.36	22.50	6.52	9.42	14.53	19.37	4.27	6.83	14.18	24.11	9.15	11.97
1967	10.53	28.43	2.19	13.14	11.43	33.93	4.35	13.77	12.46	31.83	3.42	10.25	10.64	34.75	5.63	17.60
1966	4.91	33.34	0.00	13.14	3.21	37.14	4.35	18.12	3.46	35.29	2.56	12.81	3.55	38.30	4.23	21.83
1965	5.26	38.60	2.92	16.06	3.21	40.35	7.97	26.09	2.77	38.06	6.84	19.65	3.19	41.49	4.93	26.76
1964	3.86	42.46	3.65	19.71	2.50	42.85	4.35	30.44	2.77	40.83	6.84	26.49	3.19	44.68	2.11	28.87
1963	4.91	47.37	0.73	20.44	3.93	46.78	2.17	32.61	2.08	42.91	5.98	32.47	1.77	46.45	3.52	32.39
1962	6.32	53.69	0.00	20.44	2.86	49.64	2.90	35.51	1.38	44.29	1.71	33.88	4.96	51.41	2.11	34.50
1961	5.61	59.30	4.38	24.82	4.64	54.28	1.45	36.96	3.81	48.10	2.56	36.44	2.48	53.89	2.11	36.61
1960	4.91	64.21	2.19	27.01	3.93	58.21	2.90	39.86	3.11	51.21	1.71	38.15	3.90	57.79	1.41	38.02
1959	2.81	67.02	2.19	29.20	1.79	60.00	0.72	40.58	3.46	54.67	0.85	39.00	2.13	59.92	0.70	38.72
1958	1.40	68.42	8.76	37.96	2.50	62.50	1.45	42.03	3.46	58.13	0.00	39.00	2.84	62.76	1.41	40.13
1957	1.75	70.17	2.92	40.88	2.86	65.36	0.72	42.75	3.11	61.24	0.85	39.85	.71	63.47	0.00	40.13
1956	2.81	72.98	3.65	44.53	2.86	68.22	1.45	44.20	1.04	62.28	1.71	41.56	1.06	64.53	2.11	42.24
1955	1.75	74.73	0.73	45.26	1.43	69.65	0.72	44.92	1.73	64.01	0.00	41.56	3.19	67.72	1.41	43.65
1954	5.61	80.34	2.92	48.18	3.21	72.86	1.45	46.37	1.73	65.74	0.00	41.56	1.77	69.49	0.70	44.35
1953	1.05	81.39	1.46	49.64	3.57	76.43	3.62	49.99	0.35	66.09	1.71	43.27	2.13	71.62	0.70	45.05
1952	3.16	84.55	0.00	49.64	2.14	78.57	2.17	52.16	0.35	66.44	0.85	44.12	0.00	71.62	3.52	48.57
1951	1.75	86.30	2.19	51.83	.71	79.28	2.17	54.33	0.69	67.13	0.85	44.97	.71	72.33	1.41	49.98
1950	.35	86.65	1.46	53.29	1.07	80.35	0.72	55.05	0.35	67.48	0.85	46.12	.71	73.04	1.41	51.39
Before 1950	3.35	100.00	46.71	100.00	19.65	100.00	44.95	100.00	32.52	100.00	53.88	100.00	26.96	100.00	48.61	100.00

AGE OF BOOK COLLECTION -- SEATTLE PUBLIC LIBRARY & WASHINGTON STATE LIBRARY

(continued)

TABLE A.8, cont.

SUBJECT	BIOGRAPHY (920-9)				FICTION				TOTAL			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. COLL.	5.36		7.49		3.07		9.30		100.00		100.00	
MEDIAN AGE	1960		1943		1940		1951		1960		1951	
90% YEAR	1923		1893		1901		1911		1931		1905	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	9.32		2.47		1.08		7.34		5.50		3.98	
1968	11.11	20.43	3.70	6.17	2.16	3.24	6.42	13.76	9.47	14.97	6.48	10.46
1967	7.89	28.32	1.23	7.40	2.88	6.12	11.01	24.77	9.12	24.09	4.63	15.09
1966	5.73	34.05	1.23	8.63	.72	6.84	5.50	30.27	4.78	28.87	3.52	18.61
1965	3.58	37.63	2.47	11.10	1.08	7.92	3.67	33.94	3.78	32.65	5.09	23.70
1964	3.23	40.86	2.47	13.57	.72	8.64	0.00	33.94	3.85	36.50	2.87	26.57
1963	4.30	45.16	3.70	17.27	0.00	8.64	3.67	37.61	4.23	40.73	3.05	29.62
1962	2.15	47.31	1.23	18.50	0.36	9.00	0.92	38.53	3.82	44.55	1.67	31.29
1961	2.51	49.82	6.17	24.67	2.52	11.52	2.75	41.28	4.14	48.69	2.68	33.97
1960	3.23	53.05	2.47	27.14	1.44	12.96	0.92	42.20	4.11	52.80	2.22	36.19
1959	2.15	55.20	2.47	29.61	2.88	15.84	0.00	42.20	3.21	56.01	1.57	37.76
1958	2.15	57.35	2.47	32.08	0.36	16.20	1.83	44.03	2.29	58.30	3.15	40.91
1957	2.51	59.86	1.23	33.31	0.36	16.56	0.92	44.95	2.26	60.56	1.02	41.93
1956	1.79	61.65	4.94	38.25	0.72	17.28	0.92	45.87	2.26	62.82	2.59	44.52
1955	1.79	63.44	1.23	39.48	0.72	18.00	1.83	47.70	2.26	65.08	1.02	45.54
1954	.36	63.80	0.00	39.48	1.08	19.08	0.00	47.70	1.91	66.99	1.02	46.56
1953	1.43	65.23	1.23	40.71	1.80	20.88	0.92	48.62	1.82	68.81	1.67	48.23
1952	2.15	67.38	0.00	40.71	2.16	23.04	0.00	48.62	1.68	70.49	1.30	49.53
1951	.72	68.10	1.23	41.94	1.80	24.84	1.83	50.45	1.13	71.62	1.39	50.92
1950	.36	68.46	0.00	41.94	.72	25.56	0.92	51.37	1.19	72.81	1.20	52.12
Before 1950	31.54	100.00	58.06	100.00	74.44	100.00	48.63	100.00	27.19	100.00	47.88	100.00

A.5 Overlap of Book Holdings

In order to determine to what degree library book collections were duplicative of each other, a sample was constructed of recently published titles and checked against holdings of several key libraries.

Additional small samples were taken and cross searched in libraries to determine the reliability of checking current titles in order to determine total collection overlap. Results confirmed use of the current titles as a satisfactory indicator within the bounds of accuracy and reliability as stated below.

The methodology used in the overlap study was as follows: Titles listed in the 1968 monthly issues of the American Book Publishing Record (30,387) minus paperback titles selling at $1.00 or less (2,530) were chosen as the appropriate universe. Reliability requirements were that estimated overlap (θ_e) fall within 5% of the actual overlap (θ_a) with a confidence level of 95%.

$$P\{|\theta_e-\theta_a|\leq 0.05\}\geq 0.95 \qquad (1)$$

where P = Probability

$\theta_e-\theta_a$ = Maximum error

Using the normal approximation to the binomial distribution (1) becomes

$$P\left\{|Z|\leq \frac{0.05}{\sqrt{\theta_a(1-\theta_a)/n}}\right\} \geq 0.95 \qquad (2)$$

where Z = Root of the normal distribution

for P = .95, $|Z|$ = 1.96 and (2) becomes

$$1.96 \leq \frac{0.05}{\sqrt{\theta_a(1-\theta_a)/n}}; \quad n\geq\theta_a(1-\theta_a)\left\{\frac{1.96}{0.05}\right\}^2$$

Assuming the worst case (requiring the largest n)

$$\theta_a = .5 \quad (.25)(1536.64) = 384$$

then

$(.25)(1536.64) = 384$

To obtain increased accuracy and to simplify computation, a sample size of 500 titles (95% reliability with accuracy ±2.167%) was selected.

Titles were chosen randomly from the 1968 issues of BPR, clipped and taped to key sort cards. Each citation was marked by a cataloger to indicate the best first search word(s) and the titles were checked against the catalogs of the libraries. When a title was located, the preassigned numbered hole was notched allowing for needle sorting of the cards.

Table A.9 summarizes the results of the overlap study. 438 of the 500 sample titles were located in the 33 libraries. It is estimated, therefore, that 87.6% of the 1968 American book imprints, or 24,403 titles, were purchased by this set of libraries, and were available circa January 1970. Allowing for some retrospective purchasing since and additions, however minor, provided by the libraries not searched, a reasonable estimate is that 90% of currently published American titles are purchased by the libraries in the state.

That no one library purchased more than 42% of the available titles is striking evidence of the potential cooperation through networking. Indeed, even the universities and colleges taken as a group would gain access to 38% more titles by borrowing from public and community college libraries.[1]

Figures A.3 through A.6 show cumulative distributions of different titles found for each of the three groups (types) of libraries in the sample and for all libraries in the sample.

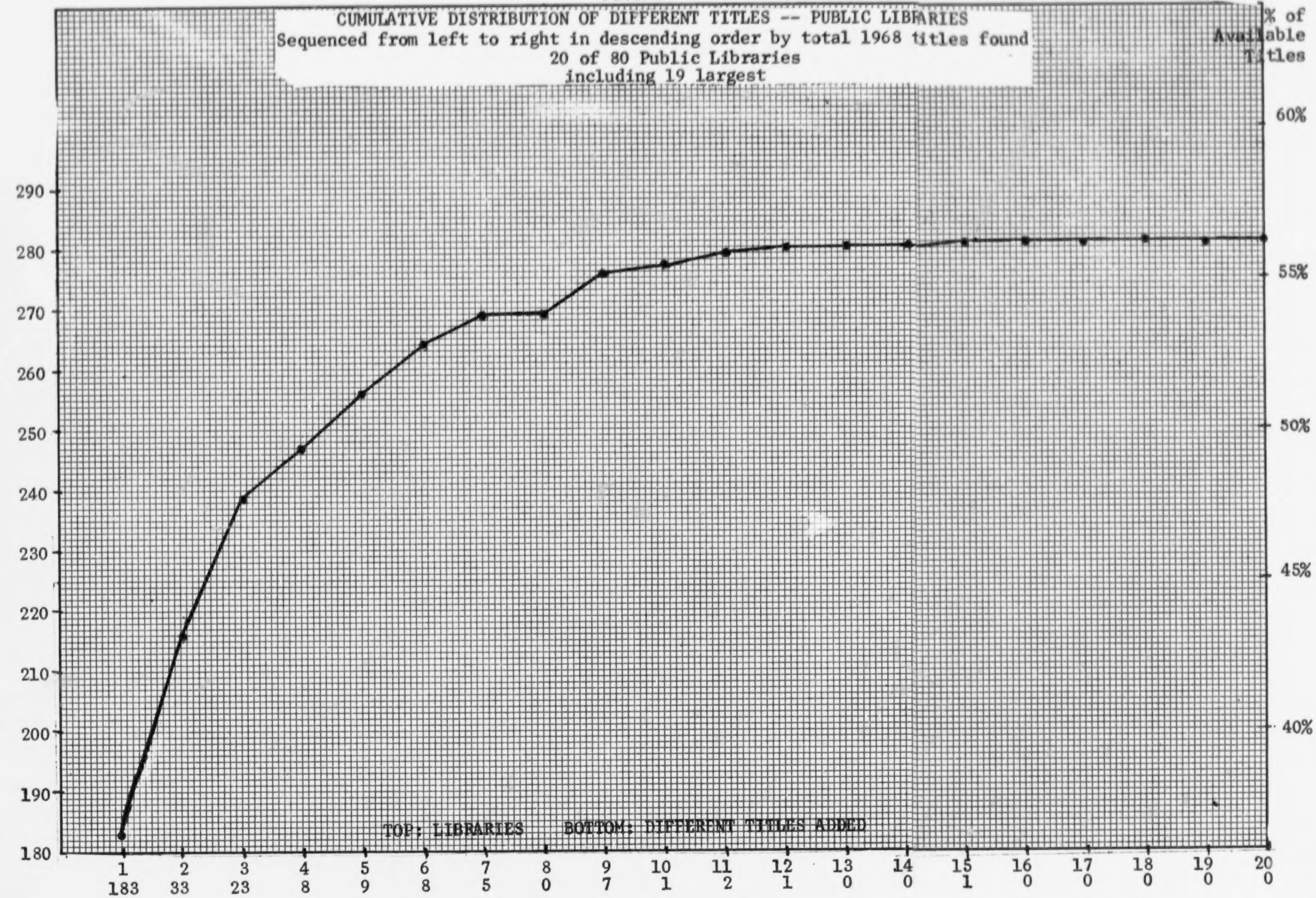
TABLE A.9

CUMULATION OF DIFFERENT TITLES FOUND

1968 SAMPLE

NO.	LIBRARY	TITLES FOUND	DIFFERENT TITLES ADDED	CUMULATED TITLES ADDED	CUMULATED PERCENTAGE
1	Washington State University	209	209	209	47.72
2	Western Washington State College	198	53	262	59.82
3	University of Washington	191	41	303	69.18
4	Seattle Public	183	66	369	84.25
5	Central Washington State College	172	9	378	86.30
6	Washington State Library	139	16	394	89.95
7	Tacoma Public	120	14	408	93.15
8	King County	112	8	416	94.98
9	Pierce County	107	4	420	95.89
10	Spokane Public	107	4	424	96.80
11	Spokane County	90	5	429	97.95
12	Longview Public	87	0	429	97.95
13	Sno-Isle Regional	87	0	429	97.95
14	Yakima Valley Regional	86	2	431	98.40
15	Timberland Regional	79	1	432	98.63
16	Bellingham Public	68	0	432	98.63
17	Everett Public	67	1	433	98.86
18	Richland Public	64	0	433	98.86
19	Fort Vancouver Regional	62	0	433	98.86
20	Kitsap County Regional	62	0	433	98.86
21	Seattle Community College	62	0	433	98.86
22	Mid-Columbia Regional	59	2	435	99.32
23	Tacoma Community College	55	1	436	99.54
24	Shoreline Community College	54	0	436	99.54
25	Walla Walla Public	52	2	438	100.00
26	Eastern Washington State College	45	0	438	100.00
27	North Central Regional	42	0	438	100.00
28	Puyallup Public	23	0	438	100.00
29	Whatcom County Regional	17	0	438	100.00
30	Yakima Valley Regional	17	0	438	100.00
31	Everett Community College	16	0	438	100.00
32	Green River Community College	11	0	438	100.00
33	Centralia Community College	7	0	438	100.00
	TOTALS	2,750	438	438	100.00

FIGURE A.3



CUMULATIVE DISTRIBUTION OF DIFFERENT TITLES -- PUBLIC LIBRARIES
Sequenced from left to right in descending order by total 1968 titles found
20 of 80 Public Libraries
including 19 largest

FIGURE A.4

CUMULATIVE DISTRIBUTION OF DIFFERENT TITLES - UNIVERSITY AND COLLEGE LIBRARIES
Sequenced from left to right in descending order by total 1968 titles found
All University and College Libraries

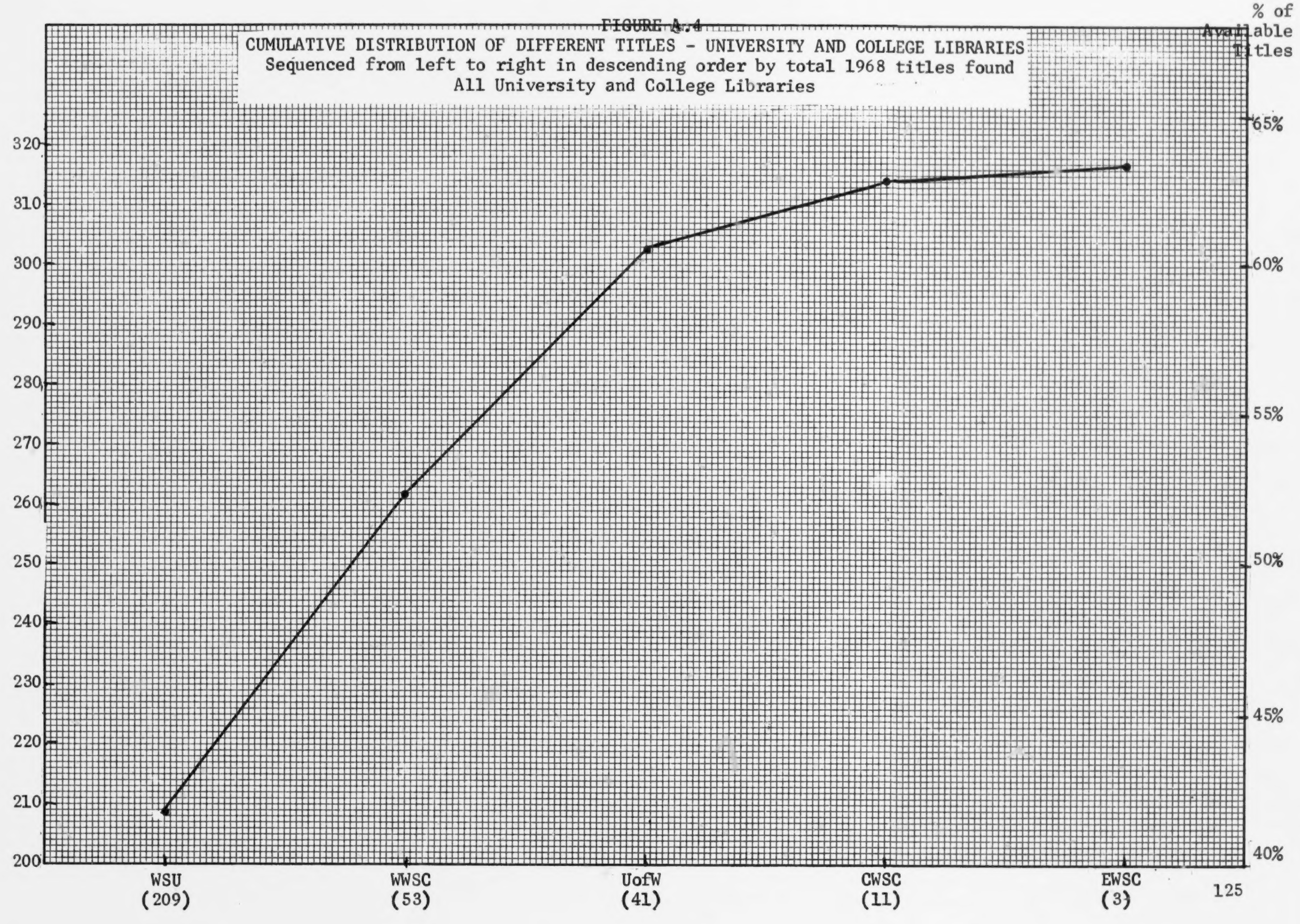
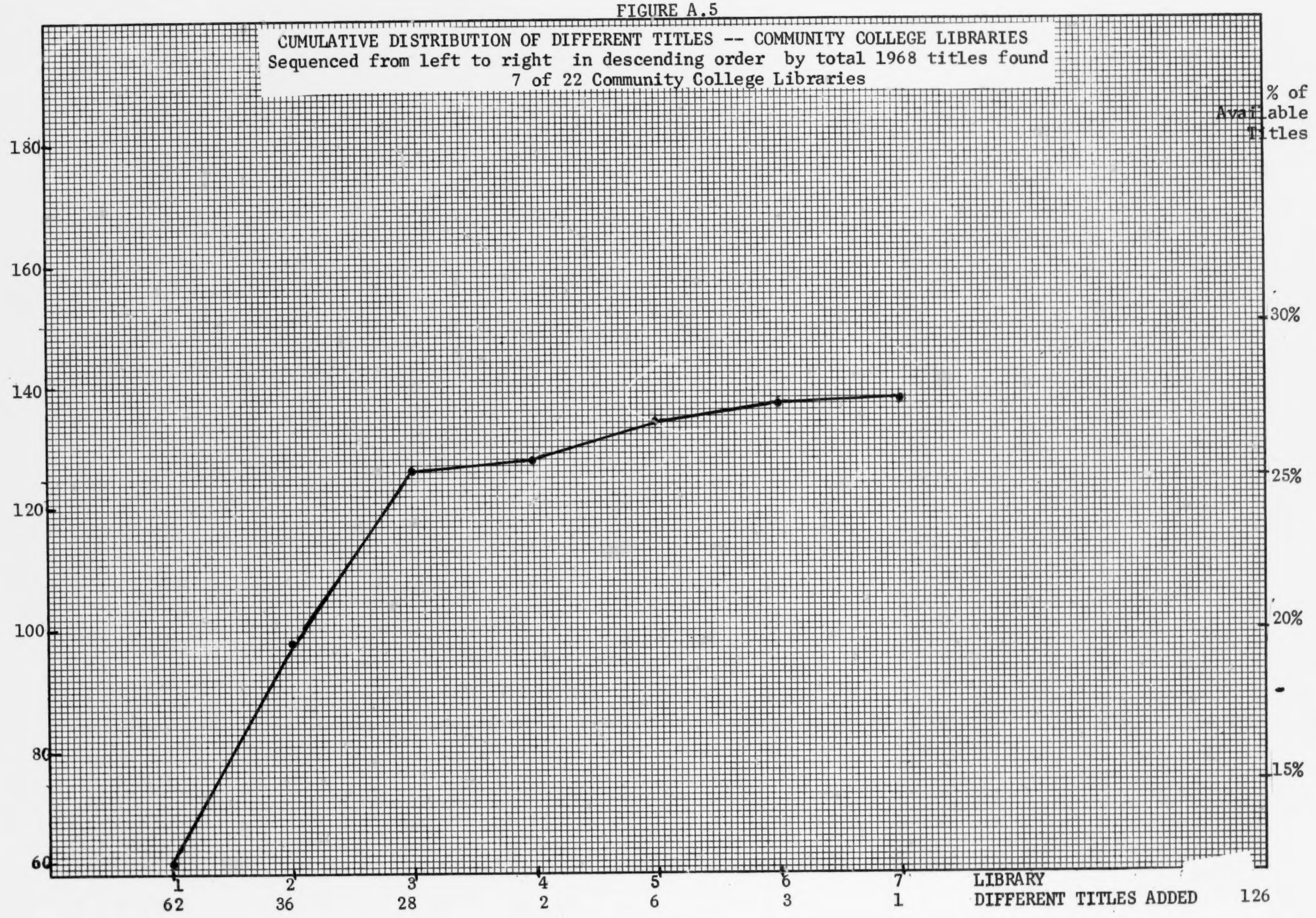
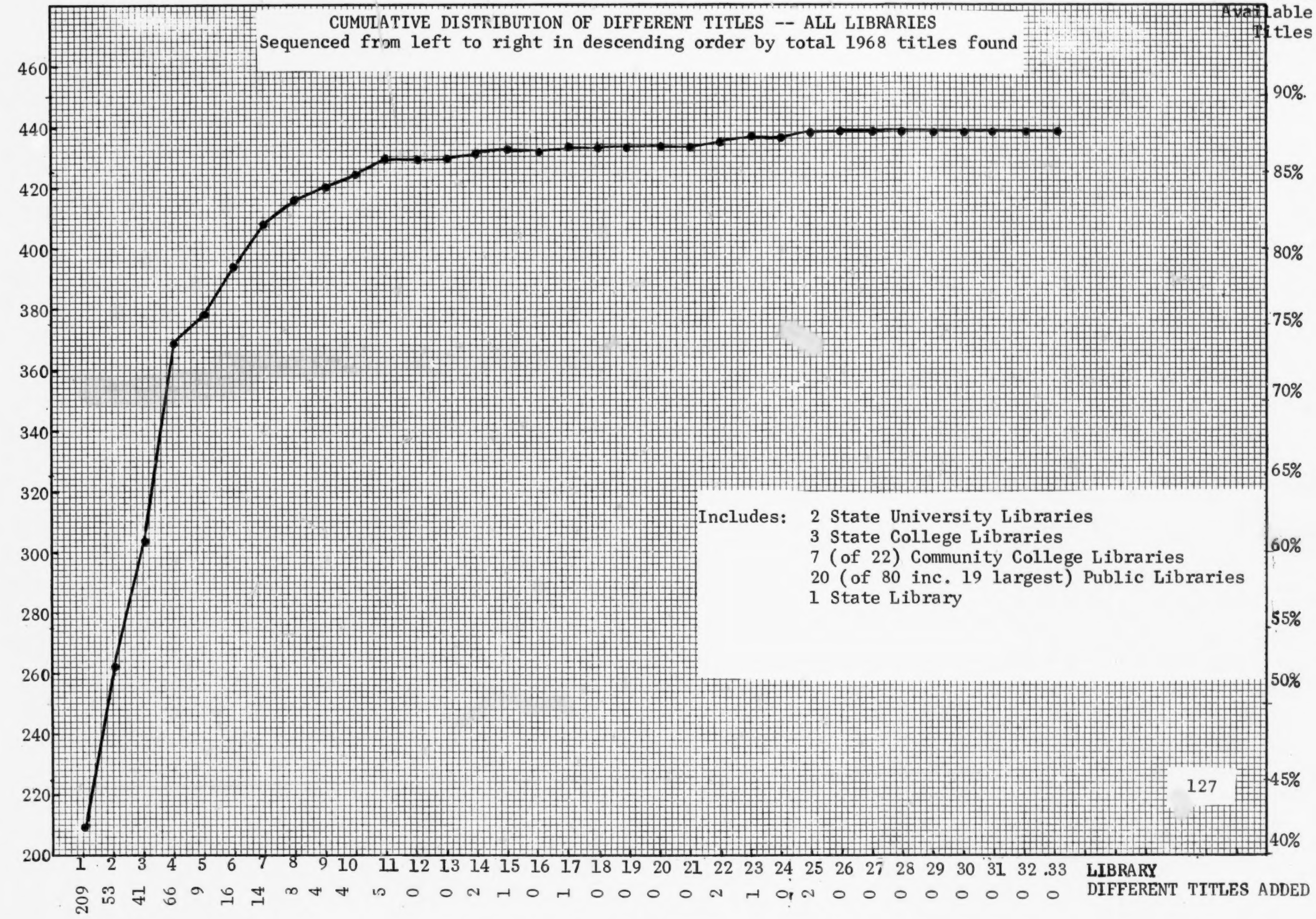


FIGURE A.5



CUMULATIVE DISTRIBUTION OF DIFFERENT TITLES -- COMMUNITY COLLEGE LIBRARIES
Sequenced from left to right in descending order by total 1968 titles found
7 of 22 Community College Libraries

FIGURE A.6



CUMULATIVE DISTRIBUTION OF DIFFERENT TITLES -- ALL LIBRARIES
Sequenced from left to right in descending order by total 1968 titles found

Includes:
2 State University Libraries
3 State College Libraries
7 (of 22) Community College Libraries
20 (of 80 inc. 19 largest) Public Libraries
1 State Library

Table A.10 and Fig. A.7 show how the located titles were distributed among which numbers of libraries. The median figure of 4.02 allows us to state that in general if a title is available in any one library, we can expect it to be also available in three additional libraries.

The Title Overlap Matrix (Table A.11) records for all paired combinations the number of titles found in one library which were also found in the second library. Thus, of the 209 titles found in the Washington State University Library, 145 of those titles were also found in the Western Washington State College (Wilson) Library.

TABLE A.10
TITLE DUPLICATION BY LIBRARIES

Examples: 58 titles were located in only 1 library.
23 titles were located in only 7 libraries.
No titles were in all 33 libraries.

No. of Libraries Holding Titles Below	1	2	3	4	5	6	7	8	9
Titles Held by Above No. of Libraries	58	54	76	30	41	24	23	17	23

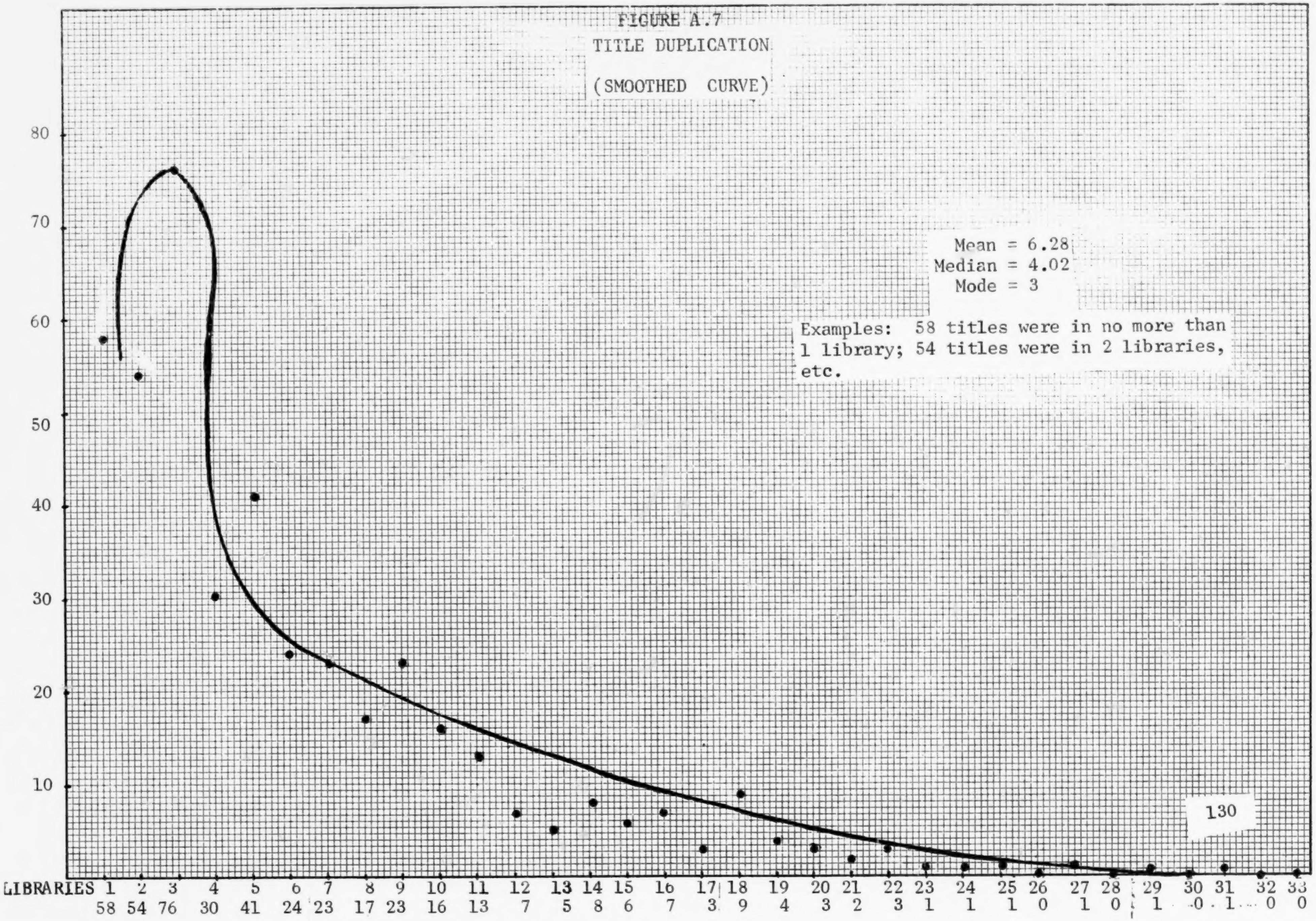
No. of Libraries Holding Titles Below	10	11	12	13	14	15	16	17	18
Titles Held by Above No. of Libraries	16	13	7	5	8	6	7	3	9

No. of Libraries Holding Titles Below	19	20	21	22	23	24	25	26	27
Titles Held by Above No. of Libraries	4	3	2	3	1	1	1	0	1

No. of Libraries Holding Titles Below	28	29	30	31	32	33
Titles Held by Above No. of Libraries	0	1	0	1	0	0

Mode = 3 libraries.
Median = 4.0244 libraries.
Mean = 6.2763 libraries.

FIGURE A.7
TITLE DUPLICATION
(SMOOTHED CURVE)



Mean = 6.28
Median = 4.02
Mode = 3

Examples: 58 titles were in no more than 1 library; 54 titles were in 2 libraries, etc.

TABLE A.11

TITLE OVERLAP MATRIX

131

NO. FOUND	NO. UNIQUE	LIBRARY	WASH. STATE UNIVERSITY	WEST. WASH. STATE COLL.	UNIV. OF WASHINGTON	SEATTLE PUBLIC LIBRARY	CENT. WASH. STATE COLL.	WASHINGTON STATE LIB.	TACOMA PUBLIC LIBRARY	KING COUNTY LIBRARY	PIERCE COUNTY LIBRARY	SPOKANE PUBLIC LIBRARY	SPOKANE COUNTY LIBRARY	LONGVIEW PUBLIC LIBRARY	SNO-ISLE REGIONAL LIB.	YAKIMA VALLEY REG. LIB.	TIMBERLAND REG. LIB.	BELLINGHAM PUB. LIB.	EVERETT PUBLIC LIBRARY	RICHLAND PUBLIC LIB.	FORT VANCOUVER REG. LIB.	KITSAP COUNTY REG. LIB.	SEATTLE COMMUNITY COLL.	MID-COLUMBIA REG. LIB.	TACOMA COMMUNITY COLL.	SHORELINE COMM. COLL.	WALLA WALLA PUB. LIB.	EAST. WASH. STATE COLL.	NORTH CENTRAL REG. LIB.	PUYALLUP PUBLIC LIB.	WHATCOM COUNTY REG. LIB.	YAKIMA VALLEY COLLEGE	EVERETT COMM. COLLEGE	GREEN RIVER COMM. COLL.	CENTRALIA COMM. COLLEGE
209	11	WASH. STATE UNIVERSITY	209	145	123	77	120	74	53	46	47	42	31	19	30	37	32	32	26	27	23	24	36	23	31	35	20	31	24	9	5	10	12	7	3
198	6	WEST. WASH. STATE COLL.	145	198	118	79	132	75	52	43	47	36	31	40	31	32	30	30	24	25	23	26	33	20	31	39	18	31	16	10	4	11	13	6	5
191	10	UNIV. OF WASHINGTON	123	118	191	83	105	84	58	48	49	43	32	42	33	41	33	36	29	31	21	42	35	26	39	30	22	27	16	13	7	7	13	9	4
183	6	SEATTLE PUBLIC LIBRARY	77	79	83	183	70	83	84	84	87	77	67	63	68	60	61	53	54	55	42	53	39	51	40	28	44	20	35	19	13	15	13	9	5
172	6	CENT. WASH. STATE COLL.	119	132	105	70	172	74	51	43	45	35	24	34	25	33	24	27	45	25	18	26	32	16	33	30	19	31	9	9	5	12	9	8	3
139	8	WASHINGTON STATE LIB.	74	75	84	83	75	139	57	53	57	50	38	41	33	40	36	35	32	32	24	30	31	27	35	27	24	24	12	11	5	13	11	8	4
120	0	TACOMA PUBLIC LIBRARY	53	52	58	87	55	57	120	62	64	64	63	57	57	55	54	47	45	46	38	48	22	45	33	19	41	22	30	20	15	10	11	5	2
112	2	KING COUNTY LIBRARY	47	43	48	84	43	53	62	112	61	60	52	59	57	52	52	45	41	46	37	42	24	41	29	16	38	19	30	14	10	9	7	4	2
107	1	PIERCE COUNTY LIBRARY	47	47	49	87	45	57	64	61	107	60	57	51	62	46	55	48	39	49	41	44	22	41	31	12	41	10	30	17	11	9	8	5	4
107	1	SPOKANE PUBLIC LIBRARY	42	36	43	77	35	50	64	60	60	107	58	49	61	48	48	43	40	47	40	42	16	44	21	10	35	16	31	17	12	6	7	4	4
90	2	SPOKANE COUNTY LIBRARY	31	31	32	67	24	38	63	52	60	58	90	47	55	44	51	36	38	44	35	42	9	48	22	9	35	7	32	20	11	5	5	3	4
87	0	LONGVIEW PUBLIC LIBRARY	30	40	43	62	35	40	47	59	51	49	47	87	54	45	40	37	38	41	31	37	17	32	23	13	32	13	27	12	10	8	8	4	3
87	0	SNO-ISLE REGIONAL LIB.	30	31	33	68	25	32	57	57	62	61	55	53	87	46	53	41	40	42	39	41	15	39	19	11	37	8	29	12	12	6	7	4	4
86	0	YAKIMA VALLEY REG. LIB.	38	32	41	60	33	40	55	52	46	48	44	45	46	86	38	34	30	37	33	33	16	35	23	11	28	16	28	15	11	10	7	7	4
79	0	TIMBERLAND REG. LIB.	32	30	33	61	25	36	54	52	55	48	51	40	53	38	79	36	33	38	30	34	12	37	21	7	35	4	27	14	12	6	8	3	2
68	0	BELLINGHAM PUB. LIB.	31	29	36	53	27	27	47	45	48	43	36	37	41	31	36	68	30	28	28	29	16	31	26	9	26	11	23	12	12	9	8	5	2
67	1	EVERETT PUBLIC LIBRARY	26	24	29	54	25	32	45	41	39	40	38	38	40	30	33	30	67	38	22	29	9	28	15	9	23	11	22	13	10	5	6	3	1
64	0	RICHLAND PUBLIC LIB.	27	25	32	55	25	32	46	46	49	47	44	41	42	37	38	28	38	64	30	36	10	36	17	8	28	9	22	13	8	5	6	4	3
62	0	FORT VANCOUVER REG. LIB.	23	23	21	42	18	24	38	37	41	41	35	32	39	33	30	28	22	30	62	23	11	29	15	8	28	10	16	12	7	7	5	5	3
62	0	KITSAP COUNTY REG. LIB.	24	26	32	53	26	30	48	42	44	42	42	37	41	32	33	30	29	36	23	62	10	33	16	9	31	8	25	12	8	7	5	4	4
62	0	SEATTLE COMMUNITY COLL.	36	33	35	39	33	31	22	24	22	16	9	17	15	16	12	16	9	10	11	10	62	10	19	23	6	13	3	5	3	9	10	4	3
59	0	MID-COLUMBIA REG. LIB.	23	20	26	51	16	27	45	41	41	44	48	32	39	35	37	31	28	36	29	33	10	59	16	8	29	6	26	15	9	7	5	3	4
55	1	TACOMA COMMUNITY COLL.	31	31	39	40	33	35	33	29	31	21	22	23	19	22	21	26	15	17	15	17	19	16	55	8	15	12	7	7	5	8	7	7	4
54	2	SHORELINE COMM. COLL.	35	39	30	28	31	27	12	16	12	10	9	13	11	11	7	9	9	8	8	9	23	8	8	54	7	13	2	3	1	5	7	2	1
52	0	WALLA WALLA PUB. LIB.	20	18	22	44	19	24	41	38	41	35	35	32	37	28	35	26	23	28	28	31	6	29	15	7	52	6	21	11	7	6	4	3	2
45	0	EAST. WASH. STATE COLL.	29	31	28	22	32	24	22	19	10	16	7	13	8	16	6	11	11	9	10	8	13	6	12	13	6	45	6	1	3	8	6	4	1
42	0	NORTH CENTRAL REG. LIB.	15	15	16	35	9	12	30	30	30	31	32	27	29	28	27	23	22	22	16	25	3	26	7	2	21	6	42	9	8	1	4	2	2
23	0	PUYALLUP PUBLIC LIB.	9	10	13	19	9	12	20	14	17	17	20	12	13	15	14	12	13	14	12	12	5	15	7	3	11	1	9	23	3	3	3	1	2
17	0	WHATCOM COUNTY REG. LIB.	5	4	7	13	5	5	15	10	11	12	11	10	12	11	12	12	10	8	7	8	3	9	5	1	7	3	8	3	17	3	3	1	0
17	0	YAKIMA VALLEY COLLEGE	10	11	12	14	12	13	10	9	9	6	5	8	6	10	6	9	5	5	7	7	9	7	8	5	6	8	1	3	3	17	3	4	1
16	0	EVERETT COMM. COLLEGE	12	13	12	13	10	10	11	7	8	7	5	8	7	7	8	8	6	6	5	5	9	5	6	6	4	6	4	3	3	3	16	2	3
11	0	GREEN RIVER COMM. COLL.	7	6	9	9	8	8	5	4	5	4	3	4	4	7	3	5	3	4	5	4	4	3	7	2	3	4	2	1	1	4	2	11	1
7	0	CENTRALIA COMM. COLLEGE	3	5	4	4	3	4	2	2	4	4	4	3	4	4	2	2	1	3	3	4	3	4	4	1	2	1	2	2	0	1	3	1	7

Table A.12 is derivative of the foregoing and shows the probability of title duplication between any pair. Thus, of all of the titles held by Washington State University, we can expect to find 69% of them (probability of .69) also at the Western Washington State College (Wilson) Library. The number of unique titles is also recorded on both matrices. Note that of the 209 titles found at WSU, only 11 were unique, i.e., not duplicated elsewhere. Both matrices are concerned only with the presence or absence of titles in a library and not with the number of duplicate copies in any library.[2]

TABLE A.12

TITLE DUPLICATION PROBABILITY MATRIX

NO. FOUND	NO. UNIQUE	LIBRARY	WASH. STATE UNIVERSITY	WEST. WASH. STATE COLL.	UNIV. OF WASHINGTON	SEATTLE PUBLIC LIBRARY	CENT. WASH. STATE COLL.	WASHINGTON STATE LIB.	TACOMA PUBLIC LIBRARY	KING COUNTY LIBRARY	PIERCE COUNTY LIBRARY	SPOKANE PUBLIC LIBRARY	SPOKANE COUNTY LIBRARY	LONGVIEW PUBLIC LIBRARY	SNO-ISLE REGIONAL LIB.	YAKIMA VALLEY REG. LIB.	TIMBERLAND REG. LIBRARY	BELLINGHAM PUBLIC LIB.	EVERETT PUBLIC LIB.	RICHLAND PUBLIC LIB.	FORT VANCOUVER REG. LIB.	KITSAP COUNTY REG. LIB.	SEATTLE COMMUNITY COLL.	MID-COLUMBIA REG. LIB.	TACOMA COMMUNITY COLL.	SHORELINE COMM. COLL.	WALLA WALLA PUB. LIB.	EAST. WASH. STATE COLL.	NORTH CENTRAL REG. LIB.	PUYALLUP PUBLIC LIB.	WHATCOM COUNTY REG. LIB.	YAKIMA VALLEY COLLEGE	EVERETT COMM. COLLEGE	GREEN RIVER COMM. COLL.	CENTRALIA COMM. COLLEGE
209	11	WASH. STATE UNIVERSITY	1.0	.69	.59	.37	.57	.35	.25	.22	.22	.20	.15	.09	.14	.18	.15	.15	.12	.13	.11	.11	.17	.11	.15	.17	.10	.15	.11	.04	.02	.05	.06	.03	.01
198	6	WEST. WASH. STATE COLL.	.73	1.0	.60	.40	.67	.38	.26	.22	.24	.18	.16	.20	.16	.16	.15	.15	.12	.13	.12	.13	.17	.10	.16	.20	.09	.16	.08	.05	.02	.06	.07	.03	.03
191	10	UNIV. OF WASHINGTON	.64	.62	1.0	.43	.55	.44	.30	.25	.26	.23	.17	.22	.17	.21	.17	.19	.15	.16	.11	.21	.18	.14	.20	.16	.12	.14	.08	.07	.04	.04	.07	.05	.02
183	6	SEATTLE PUBLIC LIBRARY	.42	.43	.45	1.0	.38	.45	.46	.46	.48	.42	.37	.34	.37	.33	.33	.29	.30	.30	.23	.29	.21	.28	.22	.15	.24	.11	.19	.10	.07	.08	.07	.05	.03
172	6	CENT. WASH. STATE COLL.	.69	.77	.61	.41	1.0	.43	.30	.25	.26	.20	.14	.20	.15	.19	.14	.16	.26	.15	.10	.15	.19	.09	.19	.17	.11	.18	.05	.05	.03	.07	.05	.05	.02
139	8	WASHINGTON STATE LIB.	.53	.54	.60	.60	.54	1.0	.41	.38	.41	.36	.27	.29	.24	.29	.26	.25	.23	.23	.17	.22	.22	.19	.25	.19	.17	.17	.09	.08	.04	.09	.08	.06	.03
120	0	TACOMA PUBLIC LIBRARY	.44	.43	.48	.73	.46	.48	1.0	.52	.53	.53	.53	.48	.48	.46	.45	.39	.38	.38	.32	.40	.18	.38	.28	.16	.34	.18	.25	.17	.13	.08	.09	.04	.02
112	2	KING COUNTY LIBRARY	.42	.38	.43	.75	.38	.47	.55	1.0	.54	.54	.46	.53	.51	.46	.46	.40	.37	.41	.33	.38	.21	.37	.26	.14	.34	.17	.27	.13	.09	.08	.06	.04	.02
107	1	PIERCE COUNTY LIBRARY	.44	.44	.46	.81	.42	.53	.60	.57	1.0	.56	.53	.48	.58	.43	.51	.45	.36	.46	.38	.41	.21	.38	.29	.11	.38	.09	.28	.16	.10	.08	.07	.05	.04
107	1	SPOKANE PUBLIC LIBRARY	.39	.34	.40	.72	.33	.47	.60	.56	.56	1.0	.54	.46	.57	.45	.45	.40	.37	.44	.37	.39	.15	.41	.20	.09	.33	.15	.29	.16	.11	.06	.07	.04	.04
90	2	SPOKANE COUNTY LIBRARY	.34	.34	.36	.74	.27	.42	.70	.58	.67	.64	1.0	.52	.61	.49	.57	.40	.42	.49	.39	.47	.10	.53	.24	.10	.39	.08	.36	.22	.12	.06	.06	.03	.04
87	0	LONGVIEW PUBLIC LIBRARY	.34	.46	.49	.71	.40	.46	.54	.68	.59	.56	.54	1.0	.62	.52	.46	.43	.44	.47	.36	.43	.20	.37	.26	.15	.37	.15	.31	.14	.11	.09	.09	.05	.03
87	0	SNO-ISLE REGIONAL LIB.	.34	.36	.38	.78	.29	.37	.66	.66	.71	.70	.63	.61	1.0	.53	.47	.46	.48	.45	.47	.17	.45	.22	.13	.43	.09	.33	.14	.14	.07	.08	.08	.05	.03
86	0	YAKIMA VALLEY REG. LIB.	.44	.37	.48	.70	.38	.47	.64	.60	.53	.56	.51	.52	.53	1.0	.44	.40	.35	.43	.38	.38	.19	.41	.27	.13	.33	.19	.33	.17	.13	.12	.08	.08	.05
79	0	TIMBERLAND REG. LIB.	.41	.38	.42	.77	.32	.48	.68	.66	.70	.61	.65	.51	.67	.48	1.0	.46	.42	.48	.38	.43	.15	.47	.27	.09	.44	.05	.34	.18	.15	.08	.10	.04	.03
68	0	BELLINGHAM PUBLIC LIB.	.46	.43	.53	.78	.40	.40	.69	.66	.71	.63	.53	.54	.60	.50	.53	1.0	.44	.41	.41	.43	.24	.46	.38	.13	.38	.16	.34	.18	.18	.13	.12	.07	.03
67	1	EVERETT PUBLIC LIBRARY	.39	.36	.43	.81	.37	.48	.67	.61	.58	.60	.57	.57	.60	.45	.49	.45	1.0	.57	.33	.43	.13	.42	.22	.13	.34	.16	.33	.19	.15	.07	.09	.04	.01
64	0	RICHLAND PUBLIC LIBRARY	.42	.39	.50	.86	.39	.50	.72	.72	.77	.73	.69	.64	.66	.58	.59	.44	.59	1.0	.47	.56	.16	.56	.27	.13	.44	.14	.34	.20	.13	.08	.09	.06	.05
62	0	FT. VANCOUVER REG. LIB.	.37	.37	.34	.68	.29	.39	.61	.60	.66	.66	.56	.52	.63	.53	.48	.45	.35	.48	1.0	.37	.18	.47	.24	.13	.45	.16	.26	.19	.11	.11	.08	.08	.05
62	0	KITSAP COUNTY REG. LIB.	.39	.42	.52	.85	.42	.48	.77	.68	.71	.68	.68	.60	.66	.52	.53	.48	.47	.58	.37	1.0	.16	.53	.26	.15	.50	.13	.40	.19	.13	.11	.08	.06	.06
62	0	SEATTLE COMM. COLLEGE	.58	.53	.56	.63	.53	.50	.35	.39	.35	.26	.15	.27	.24	.26	.19	.26	.15	.16	.18	.16	1.0	.16	.31	.37	.10	.21	.05	.08	.05	.15	.16	.06	.05
59	0	MID-COLUMBIA REG. LIB.	.39	.34	.44	.86	.27	.46	.76	.69	.69	.75	.81	.54	.66	.59	.63	.53	.47	.61	.49	.56	.17	1.0	.27	.14	.49	.10	.44	.25	.15	.12	.08	.05	.07
55	1	TACOMA COMMUNITY COLL.	.56	.56	.71	.73	.60	.64	.60	.53	.56	.38	.40	.42	.35	.40	.38	.47	.27	.31	.27	.31	.35	.29	1.0	.15	.27	.22	.13	.13	.09	.15	.13	.13	.07
54	2	SHORELINE COMM. COLL.	.65	.72	.56	.52	.57	.50	.22	.30	.22	.19	.17	.24	.20	.20	.13	.17	.17	.15	.15	.17	.43	.15	.15	1.0	.13	.24	.04	.06	.02	.09	.13	.04	.02
52	0	WALLA WALLA PUB. LIB.	.38	.35	.42	.85	.37	.46	.79	.73	.79	.67	.67	.62	.71	.54	.67	.50	.44	.54	.54	.60	.12	.56	.29	.13	1.0	.12	.40	.21	.13	.12	.08	.06	.04
45	0	EAST. WASH. STATE COLL.	.64	.69	.62	.49	.71	.53	.49	.42	.22	.36	.16	.29	.18	.36	.13	.24	.24	.20	.22	.18	.29	.13	.27	.29	.13	1.0	.13	.02	.07	.18	.13	.09	.02
42	0	NO. CENTRAL REG. LIB.	.36	.36	.38	.83	.21	.29	.71	.71	.71	.74	.76	.64	.69	.67	.64	.55	.52	.52	.38	.60	.07	.62	.17	.05	.50	.14	1.0	.21	.19	.02	.10	.05	.05
23	0	PUYALLUP PUBLIC LIBRARY	.39	.43	.57	.83	.39	.52	.87	.61	.74	.74	.87	.52	.57	.65	.61	.52	.57	.61	.52	.52	.22	.65	.30	.13	.48	.04	.39	1.0	.13	.13	.13	.04	.09
17	0	WHATCOM CO. REG. LIB.	.29	.24	.41	.76	.29	.29	.88	.59	.65	.71	.65	.59	.71	.65	.71	.71	.59	.47	.41	.47	.18	.53	.29	.06	.41	.18	.47	.18	1.0	.18	.18	.06	.00
17	0	YAKIMA VALLEY COLLEGE	.59	.65	.71	.82	.71	.76	.59	.53	.53	.35	.29	.47	.35	.59	.35	.53	.29	.29	.41	.41	.53	.41	.47	.29	.35	.47	.06	.18	.18	1.0	.18	.24	.06
16	0	EVERETT COMM. COLLEGE	.75	.81	.75	.81	.63	.63	.69	.44	.50	.44	.31	.50	.44	.44	.50	.50	.38	.38	.31	.31	.56	.31	.38	.38	.25	.38	.25	.19	.19	.19	1.0	.13	.19
11	0	GREEN RIVER COMM. COLL.	.64	.55	.82	.82	.73	.73	.45	.36	.45	.36	.27	.36	.36	.64	.27	.45	.27	.36	.45	.36	.36	.27	.64	.18	.27	.36	.18	.09	.09	.36	.18	1.0	.09
7	0	CENTRALIA COMM. COLLEGE	.43	.71	.57	.57	.43	.57	.29	.29	.57	.57	.57	.43	.57	.57	.29	.29	.14	.43	.43	.57	.43	.57	.57	.14	.29	.14	.29	.29	.00	.14	.43	.14	1.0

REFERENCES

1. Caution should be used in making comparisons between libraries recorded as having in excess of about 180 titles. For example, the University of Washington's title acquisitions in 1968 exceeded 30,000. Considerable purchasing, therefore, was made from titles outside the sampled universe of American imprints.

2. The average number of duplicate copies held by libraries is approximated by that library's volume to title ratio. Multiple volume sets do not appear to be sufficient in number to distort the volume/title ratio as a reasonably high average.

APPENDIX B
BOOK CIRCULATION CHARACTERISTICS

Discussion of collection management in Chapter 4 is partially dependent on the concept of low circulation volumes and this in turn requires a knowledge of yearly circulation rates and other characteristics of books and their use. This appendix consists of such data and includes results derived from them. There were four libraries whose circulations were studied extensively. The Washington State Library, Seattle Public Library, Central Washington State College Library and Bellingham Public Library.

B.1 Methodology

All circulation studies were carried out by means of sampling in the four libraries mentioned above. However, the size of samples varied over a wide range because of both the availability of data and the time constraints of the study.

Two main samples were drawn and analyzed at the Washington State Library. One was a sample of approximately 1,800 books in circulation. This was drawn by intercepting and recording data from all books returned over a three-day period. Various data items were recorded such as call number, date of publication, date circulated, etc. The information gathered was used in producing Tables B.1, B.3 and B.13. The second sample consisted of 1,490 items drawn from the shelf list by taking the nth card from the kth draw. K was a function of the number of draws and n was selected randomly.

For each item the following information was recorded:

a) Complete call number
b) Brief author and title
c) Date of publication

When the sample was completely drawn and recorded a search for each item was made on the shelves and in the circulation file. When the item was located the following information was recorded:

a) Number of times circulated in each year as recorded on the book card.
b) Full date (month, day, and year of the last circulation.)

This sample was analyzed to produce Tables B.4 through B.7.

One circulation sample was drawn and analyzed at the Seattle Public Library. This consisted of items returned to the circulation desk in the main library and in three branches over a period of 3 days. Data recorded was the same as for the first State Library sample described above. Analysis resulted in Tables B.1, B.3, and B.12.

Samples of circulation from Central Washington State College Library and Bellingham Public Library are similar in that they consist of complete circulation records for a fixed period of time in machine readable form. For Central Washington this was an eighteen-month period from January 2, 1968, to June 30, 1969. The sample consisted of 75,365 circulations of 30,876 titles. The Bellingham sample covered the period from January 2, 1970, through March 31, 1970. The sample consisted of 111,833 circulations of 34,724 titles. The analysis of these samples is described in more detail in section B.2 below. This analysis produced tables B.8 through B.11 and Figures B.6 and B.7.

Additional data were collected in libraries visited by the research team. These were in most cases precollected statistics relating to the subject distribution of circulation and had been gathered by the individual library administrators in the course of their normal operations. Presentation of these data is given in Tables B. 1 and B.2.

B.2 Computer Analysis of Circulation Records

During the course of the study, the research team gained access to complete circulation records in machine-readable form for Central Washington State College Library and Bellingham Public Library. These records were analyzed by computer to extract various kinds of needed information. This section describes the institutions, the records and the analysis and presents sample outputs and a program listing. Results of the analysis are presented in section B.5.

Central Washington State College is located in Ellensburg. It has been in existence since 1890, and started as the Washington State Normal School. It began granting master's degrees in 1947, and at present offers undergraduate majors in 42 subject areas and master's degrees in 10 subjects plus the Master of Education degree in 26 specialities. Enrollment was 9,266 in the fall of 1968.

The Bellingham Public Library was founded in 1904 and presently serves a population of 38,000people. It has two branch libraries in addition to its main headquarters. The city of Bellingham is a mixed suburban and light industrial city with one of the four state colleges located there. The reported total for number of volumes in the collection was 124,011 at the end of 1969. Circulation for the calendar year 1969 was reported as 411,993.

In general the techniques of analysis for both data sets were the same. Essentially the same computer program was used for both analyses and the outputs were essentially identical. Therefore, the description given here will deal with the Central Washington sample and parenthetical notes will indicate any unique characteristics of the Bellingham data or analysis.

Both libraries have circulation control systems based on the IBM 357 machine configuration. This machine set produces for each charge out, an 80 column punched card carrying book and borrower identification information. Upon return of the book another card is generated carrying book information but indicating that an existing charge, represented by the card previously produced, is to be cancelled. The charge out and return cards are matched and the charges cancelled.

The first step taken when the cards for CWSC were received was to sort them by call number and transfer the data to tape. The various data elements were reorganized into a different fixed format at this time to facilitate future manupulation. To insure accuracy a print of the entire data base was then obtained to check for any unforeseen problems. (This was not done with the Bellingham data since the program had been developed to a point of sufficient confidence). An analysis of the print-out revealed that the only major problem was concerned with counting different titles which had circulated. When the data were arrayed by titles (see figure B.1) the machine sort was performed on the whole call number. If the call number differed from the one previously checked in any way, the program considered it a new "title". In some cases this meant that different volumes or different copies of the same work would be counted as different titles if a volume or copy designation appeared in the call number. In order to include circulations of multi-volume or multi-copy works under one "title" we established the following logic. If call number 2 (the one being counted) is identical to call number 1 (the one counted immediately previously) except for a difference in the last three characters and two of those last three are either "c." or "v.", count this as an additional circulation of the previous title. If the call numbers are completely identical count this as an additional circulation of the previous title. If these criteria are not met consider this a net title.

The final step was to generate a frequency distribution of the number of circulations per title circulated. Sample pages from the distributions for C. W. S. C. and Bellingham are shown in figures B.2 and B.3 respectively. The parameters were chosen to show the number of titles which circulated 1, 2, 3, . . . 24 and over 24 times in the period. Twenty-four was chosen arbitrarily as the upper bound and seems adequate since only .099 percent of the titles at C.W.S.C. circulated more than this number. (.43 percent of the titles at Bellingham.) The distribution is broken down by subject to the level of two letters in LC, e.g. "QA", "QB". (The hundreds and tens digits in Dewey on the Bellingham distribution, e.g. 010-019 +, 020-029+).

The program listing is given in figure B.4.

SAMPLE PAGE FROM PRINT-OUT OF CENTRAL WASHINGTON STATE COLLEGE CIRCULATION DATA BASE FIGURE B.1

```
    CLASS  CALL          ACCESS   CHARGE   RETURN   TIME    USER USER      DUR    AUTHOR AND TITLE
           NUMBER        NUMBER   YR DAY   YR DAY   OUT     CODE NUMBER

     AS    0036M75V.2    001019   69 030                    0    6534350   2      MISSOURI.-NORTHWEST-MISSOURI-STA-
     AS    0036M75V.2    001019   69 121                    0    6913500   2      MISSOURI.-NORTHWEST-MISSOURI-STA-

     AS    0284G6V.64    001103   69 019                    4    7529392   2      HAGENDAHL-HARALD LATIN-FATHERS-AND--
     AS    0284G6V.64    001103   69 034                    0    3370170   2      HAGENDAHL-HARALD LATIN-FATHERS-AND--


*** CLASS  TOTAL    TOTAL
           ENTRY    CALL NUMBERS
     AS     10        5


    CLASS  CALL          ACCESS   CHARGE   RETURN   TIME    USER USER      DUR    AUTHOR AND TITLE
           NUMBER        NUMBER   YR DAY   YR DAY   OUT     CODE NUMBER

     AZ    0101J6        132541   68 148                    0    5638670   2      JONES-WILLIAM-THOMAS THE-ROMANTIC-SYNDROME------

     AZ    0105J64       139501   68 025                    3    7141756   2      JONES-WILLIAM-THOMAS SCIENCES-AND-HUMANITIES---

     AZ    0108K62-19    000787   68 304                    0    5307310   2      KOCH-RUDOLF BOOK-OF-SIGNS-WHICH-CONT-
     AZ    0108K62-19    000787   68 331                    0    1288980   2      KOCH-RUDOLF BOOK-OF-SIGNS-WHICH-CONT-
     AZ    0108K62-19    078794   68 190                    4    2364257   2      KOCH-RUDOLF BOOK-OF-SIGNS-WHICH-CONTAINS--
     AZ    0108K62-19    078794   68 207                    0    4577290   2      KOCH-RUDOLF BOOK-OF-SIGNS-WHICH-CONTAINS--

     AZ    0221J3        000324   68 277                    0    9500390   2      JASTROW-JOSEPH STORY-OF-HUMAN-ERROR--------

     AZ    0361G7-196    001528   69 091                    0    7032500   2      GREEN-MARTIN-BURGESS SCIENCE-AND-THE--

     AZ    0361S56       000961   69 024                    0    7033760   2      SNOW-CHARLES-PERCY TWO-CULTURES-AND-THE-S-
     AZ    0361S56       000961   69 091                    0    7032500   2      SNOW-CHARLES-PERCY TWO-CULTURES-AND-THE-S-
     AZ    0361S56       000961   69 100                    0    1985520   2      SNOW-CHARLES-PERCY TWO-CULTURES-AND-THE-S-

     AZ    0361S57L4     001321   68 303                    0    8938460   2      LEAVIS-FRANK-RAYMO-D TWO-CULTURES-------
     AZ    0361S57L4     001321   68 317                    0    8938460   2      LEAVIS-FRANK-RAYMO-D TWO-CULTURES-------

     AZ    0505C8        076078   68 029                    3    7141756   2      CURTI-MERLE-EUGENE AMERICAN-SCHOLARSHIP-IN-THE--
     AZ    0505C8        076078   68 155                    3    2143324   2      CURTI-MERLE-EUGENE AMERICAN-SCHOLARSHIP-IN-THE--

     AZ    0507C6C.4     143020   68 029                    3    7141756   2      COMMISSION-ON-THE-HUMANITIES REPORT----------

     AZ    0515A53       075285   68 065                    0    9061790   2      CANADA.-ROYAL-COMMISSION-ON-NATIONAL-DEVELOPME-

     AZ    0604S3-196    001580   69 092                    0    6603090   2      SCHENK-HANS-GEORG-ARTUR-VIKTOR MIND-O-
     AZ    0604S3-196    001580   69 124                    0    6603090   2      SCHENK-HANS-GEORG-ARTUR-VIKT-R MIND-O-

     AZ    0613W4-196    001665   68 270                    3    1321665   2      WEISS-ROBERTO HUMANISM-IN-ENGLAND-DUR-

     AZ    0999M2-195    001125   69 023                    0    3205500   2      MACKAY-CHARLES 5XTRAORDINARY-POPULAR--

     AZ    0999M6        001570   69 058                    0    4894160   2      MONTAGU-ASHLEY PREVALENCE-OF-NONSENSE,-196-


*** CLASS  TOTAL    TOTAL
           ENTRY    CALL NUMBERS
     AZ     22        14
```

CENTRAL WASHINGTON STATE COLLEGE LIBRARY
CIRCULATION FREQUENCY DISTRIBUTION BY CLASS -- SAMPLE PAGE
FIGURE B.2

R0106385
PAGE 001

CLASS	NUMBER OF TIMES CHECK OUT 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	OVER 24
AC	2	1		1																					
AG	2				1																				
AS	1	2			1																				
AZ	9	3	1	1																					
INT TOTAL	14	6	1	2	2																				
B	1																								
B-	281	139	77	54	30	18	12	8	4	2	1	1	2	1	2										
BC	33	13	2	1	1	1		1																	
BD	59	20	5	9	1	2		1																	
BF	382	255	175	121	93	65	50	39	22	11	15	15	3	4	3	4	1	1				1			10
BH	18	1			1	1																			
BJ	71	23	15	4	1		1		1																
BL	91	48	31	27	17	10	7	2	4	2						1	1								
BM	20	4		2	2	1																			
BP	6	4		1																					
BR	66	26	19	9	7	3	1																		
BS	35	11	7	1	1																				
BT	21	7	2	2		1																			
BV	28	7	2	1	1																				
BX	68	33	22	10	9	2	1	2			1														
INT TOTAL	1180	591	357	242	164	104	72	53	31	15	17	16	5	5	5	5	2	1				1			10
CB	55	29	14	7	6																				
CC	10		4																						
CD	1																								
CJ	3																								
CR	4	2																							
CS	2																								
CT	28	10	4		2	1																			
INT TOTAL	103	41	22	7	8	1																			
D	2																								
D-	293	126	62	31	14	8	4	2	1	1	1	1				2						1			
DA	208	103	52	38	25	12	5	4	4	1			1	1			1		1						
DB	15	10	4	2	4	3	1		2		1														

```
                                   Bellingham  Public  Library                                                     R0106385
                    Circulation FREQUENCY DISTRIBUTION BY CLASS    -- Sample Page                                 PAGE 002
                                           FIGURE B.3
CLASS                                NUMBER OF TIMES CHECK OUT                                                         OVER
           1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18    19    20    21    22    23    24    24

    30   174   120    92    55    28    19     9     5     5     1     1     1     1
    31    13     3     3     1
    32   260   113    60    13    12     3     2     4     2     1     1           1     3
    33   217    98    55    32    15    12     5     2     2                         1     2
    34   104    58    20     9     4     1           2     1     1     2                                   1
    35   157    64    41    19     9    11     5     4     1     1                 1                                                     1
    36   139    86    57    27    17    21     6     7     5     5     4     4           2     2                 1
    37   159    90    41    33    17    11     4     3     1     1                       1
    38    65    23    13    13     9     5     3     2     2     3     1     1
    39   150    83    35    25     5     8     1           1           1

   INT
 TOTAL  1438   738   417   227   116    91    35    29    20    13    10     6     3     7     4           1     1                       1


    40     3           2
    41    15     4     1     1
    42    38    14     6     4                                   1
    43     9     6     6     3     2
    44     6     2     2           1
    45     2     2
    46     2     7     7     1     1
    47     3     2
    48     4     1
    49     8     5     4     2     1

   INT
 TOTAL    90    43    28    11     5                             1


    50    44    13    11     7     6     3     1     1           1     1     1     1
    51    65    47    22     7     2     1
    52    58    43    20    11     6     1
    53    75    16     6     4     1
    54    34    15     9     6     1           1
    55   109    57    38    17     7           4     1           1
    56    13     9     3     1     3
    57   129    73    39    27     8     3     2     1                 3                             1
    58    91    55    26    18     6     2           1     2
    59   217   135    77    54    39    22     9     2     2     4     1           1     1                 1

   INT
 TOTAL   835   463   251   152    79    32    17     6     4     6     5     1     2     1           1     1
```

FIGURE B.4 PROGRAM LISTING - CIRCULATION ANALYSIS PROGRAM
COBOL F

```
LEVEL 1JAN67                                                                                  DATE MAY 15,1970

   1

00001    001010 IDENTIFICATION DIVISION.                                    VEGB0106
00002    001020 PROGRAM-ID.     'B0106385'.                                 VEGB0106
00003    001030 AUTHOR.          VIVIENNE GROUT.                            VEGB0106
00004    001040 INSTALLATION.   WSDPSC.                                     VEGB0106
00005    001050 DATE-WRITTEN.   MARCH 1970.                                 VEGB0106
00006    001060 DATE-COMPILED. MAY 15,1970                                  VEGB0106
00008    001130 ENVIRONMENT DIVISION.                                       VEGB0106
00009    001140 CONFIGURATION SECTION.                                      VEGB0106
00010    001150 SOURCE-COMPUTER.    IBM-360 I50.                            VEGB0106
00011    001160 OBJECT-COMPUTER.    IBM-360 I50.                            VEGB0106
00012    001170 INPUT-OUTPUT SECTION.                                       VEGB0106
00013    001180 FILE-CONTROL.                                               VEGB0106
00014    001190     SELECT IN-REC   ASSIGN TO 'IN1'  UTILITY.               VEGB0106
00015    001200     SELECT OT-REC   ASSIGN TO 'OUT1' UTILITY.               VEGB0106
00016    001210 DATA DIVISION.                                              VEGB0106
00017    001220 FILE SECTION.                                               VEGB0106
00018
00019    002010 FD  IN-REC                                                  VEGB0106
00020    002020     RECORDING MODE IS F                                     VEGB0106
00021    002030     RECORD CONTAINS 80 CHARACTERS                           VEGB0106
00022    002040     BLOCK CONTAINS 0 RECORDS                                VEGB0106
00023    002050     LABEL RECORDS ARE OMITTED                               VEGB0106
00024               DATA RECORDS ARE INPUT-REC INPUT-REC-2.
00025            01 INPUT-REC-2.
00026               05  FILLER      PICTURE X(5).
00027               05  ID-NR-2     PICTURE X(8).
00028               05  FILLER      PICTURE XX.
00029               05  USER-CODE-2 PICTURE X.
00030               05  USER-NR     PICTURE X(7).
00031               05  POS-24      PICTURE X.
00032               05  DUR-2       PICTURE X.
00033               05  POS-26      PICTURE X.
00034               05  FILLER      PICTURE X(54).
00035    002070 01  INPUT-REC.                                              VEGB0106
00036    002080     05  OUT-YR-DY.                                          VEGB0106
00037    002090         10  OUT-YR                          PICTURE X.      VEGB0106
00038    002100         10  FILLER                          PICTURE XXX.    VEGB0106
00039    002110     05  COL5-13-1.                                          VEGB0106
00040    002120         10  TYPER                           PICTURE X.      VEGB0106
00041    002125             88  TYPE1   VALUE '&'.                          VEGB0106
00042    002130         10  ACCESS-1                        PICTURE X(6).   VEGB0106
00043    002140         10  FILLER                          PICTURE XX.     VEGB0106
00044    002150     05  COL5-13-2   REDEFINES COL5-13-1.                    VEGB0106
00045    002160         10  FILLER                          PICTURE XXX.    VEGB0106
00046    002170         10  ACCESS-2                        PICTURE X(6).   VEGB0106
00047    002180     05  USER-COD-IN                         PICTURE X.      VEGB0106
00048    002190     05  USER-NO                             PICTURE X(7).   VEGB0106
00049    002200     05  FILLER                              PICTURE X.      VEGB0106
00050    002210     05  DUR-IN                              PICTURE X.      VEGB0106
00051    002220     05  VARY-FLD                            PICTURE X(57).  VEGB0106
00052    002230     05  REDEF-VARY  REDEFINES VARY-FLD.                     VEGB0106
00053    002240         10  VARY-ITEM OCCURS 57 TIMES       PICTURE X.      VEGB0106
00054
00055    003010 FD  OT-REC                                                  VEGB0106
```

FIGURE B.4, cont.

```
2

00056   003020        RECORDING MODE IS F                                      VEGB0106
00057   003030        RECORD CONTAINS 120 CHARACTERS                           VEGB0106
00058   003040        BLOCK CONTAINS 0 RECORDS                                 VEGB0106
00059   003050        LABEL RECORDS ARE STANDARD                               VEGB0106
00060   003060        DATA RECORD IS OUTPUT-REC.                               VEGB0106
00061   003070 01   OUTPUT-REC                         PICTURE X(120).       VEGB0106
00062
00063   003100 WORKING-STORAGE SECTION.                                        VEGB0106
00064   003110 77   FILLER  VALUE 'WORK AREA STARTS HERE'   PICTURE X(21).     VEGB0106
00065   003120 77   SUBS-IN         VALUE 0 COMPUTATIONAL   PICTURE S99.       VEGB0106
00066   003130 77   SUBS-OUT        VALUE 0 COMPUTATIONAL   PICTURE S99.       VEGB0106
00067
00068   004010 01   WK-OUT.                                                    VEGB0106
00069   004020      05  FILLER                         PICTURE XXX.          VEGB0106
00070   004030      05  BK-ALF1                        PICTURE X.            VEGB0106
00071   004040      05  BK-ALF2                        PICTURE X.            VEGB0106
00072   004050      05 BK-NUM       OCCURS 10 TIMES    PICTURE X.            VEGB0106
00073   004060      05  ACC-NO                         PICTURE X(6).         VEGB0106
00074   004070      05  INSERT-YR                      PICTURE X.            VEGB0106
00075   004080      05  OUT-DATE                       PICTURE X(4).         VEGB0106
00076   004090      05  FILLER                         PICTURE X(8).         VEGB0106
00077   004100      05  DURATION                       PICTURE X.            VEGB0106
00078   004110      05  FILLER                         PICTURE X.            VEGB0106
00079   004120      05  USER-COD                       PICTURE X.            VEGB0106
00080   004130      05  USER-NMBR                      PICTURE X(7).         VEGB0106
00081   004140      05  FILLER                         PICTURE X(8).         VEGB0106
00082   004150      05  AUTH-TITLE                     PICTURE X(68).        VEGB0106
00083   004160      05  REDEF-AUTH  REDEFINES AUTH-TITLE.                      VEGB0106
00084   004170          10  SINGLE-AUTH OCCURS 68 TIMES    PICTURE X.            VEGB0106
00085
00086   005010 01   STAT-LINE.                                                 VEGB0106
00087   005020      05  FILLER                         PICTURE X(18)  VALUE VEGB0106
00088   005030              'TOTAL RECORDS IN                                  VEGB0106
00089   005040      05  CT-IN        VALUE 0           PICTURE 9(6).         VEGB0106
00090   005050      05  FILLER                         PICTURE X(23)  VALUE VEGB0106
00091   005060              '    TOTAL RECORDS OUT                             VEGB0106
00092   005070      05  CT-OT        VALUE 0           PICTURE 9(6).         VEGB0106
00093
00094   010010 PROCEDURE DIVISION.                                             VEGB0106
00095   010020      OPEN INPUT IN-REC, OUTPUT OT-REC.                          VEGB0106
00096
00097   010030 READ-REC.                                                       VEGB0106
00098   010040      READ IN-REC AT END GO TO CLOSE-UP.                         VEGB0106
00099   010050      ADD 1 TO CT-IN.                                            VEGB0106
00100               IF CT-IN   200 GO TO CLOSE-UP.
00101   010060      MOVE 'AA' TO WK-OUT.                                       VEGB0106
00102   010070      IF OUT-YR   '0' MOVE '7' TO INSERT-YR   ELSE               VEGB0106
00103   010080                      MOVE '6' TO INSERT-YR.                     VEGB0106
00104   010090      MOVE OUT-YR-DY TO OUT-DATE.                                VEGB0106
00105   010095      IF  POS-24 n 'A' OR   'Z'   GO TO  CHECK-REC-2.            VEGB0106
00106   010110                MOVE ACCESS-2 TO ACC-NO.                         VEGB0106
00107   010120      MOVE USER-COD-IN TO USER-COD.                              VEGB0106
00108   010130      MOVE USER-NO      TO USER-NMBR.                            VEGB0106
00109   010140      MOVE DUR-IN       TO DURATION.                             VEGB0106
00110   010150      MOVE 1 TO SUBS-OUT,     MOVE 2 TO SUBS-IN.                 VEGB0106
00111   010160      MOVE VARY-ITEM (1) TO BK-ALF1.                             VEGB0106
00112   010170      IF VARY-ITEM (2) n '0' OR   '9' NEXT SENTENCE   ELSE       VEGB0106
```

FIGURE B.4, cont.

```
010175        GO TO LOOP-BOOK.                                          VEGB0106
010180      MOVE VARY-ITEM (2) TO BK-ALF2.                              VEGB0106
010190      ADD 1 TO SUBS-IN.                                           VEGB0106

011010 LOOP-BOOK.                                                       VEGB0106
011020      IF SUBS-IN   57 GO TO MOVE-WORK.                            VEGB0106
011030      IF VARY-ITEM (SUBS-IN)   '*'    ADD 1 TO SUBS-IN,           VEGB0106
011040        MOVE 1 TO SUBS-OUT, GO TO LOOP-TITLE.                     VEGB0106
011050      IF SUBS-OUT   10    ADD 1 TO SUBS-IN, GO TO LOOP-BOOK.      VEGB0106
011060      MOVE VARY-ITEM (SUBS-IN) TO BK-NUM (SUBS-OUT).              VEGB0106
011070      ADD 1 TO SUBS-IN,   ADD 1 TO SUBS-OUT.                      VEGB0106
011080      GO TO LOOP-BOOK.                                            VEGB0106

011090 LOOP-TITLE.                                                      VEGB0106
011100      MOVE VARY-ITEM (SUBS-IN) TO SINGLE-AUTH (SUBS-OUT).         VEGB0106
011110      IF SUBS-IN ¤ 57     ADD 1 TO SUBS-IN, ADD 1 TO SUBS-OUT,    VEGB0106
011120        GO TO LOOP-TITLE.                                         VEGB0106
011130      EXAMINE AUTH-TITLE REPLACING ALL '*' BY SPACE.              VEGB0106

011140 MOVE-WORK.                                                       VEGB0106
011150      MOVE WK-OUT TO OUTPUT-REC.                                  VEGB0106
011160      WRITE OUTPUT-REC.                                           VEGB0106
011170      ADD 1 TO CT-OT.                                             VEGB0106
011180      GO TO READ-REC.                                             VEGB0106

012010 CLOSE-UP.                                                        VEGB0106
012020      DISPLAY STAT-LINE.                                          VEGB0106
012030      CLOSE IN-REC, OT-REC.                                       VEGB0106
012040      STOP RUN.                                                   VEGB0106
       CHECK-REC-2.
            IF  POS-26 ¤ 'A' OR   'Z'   GO TO  READ-REC.                VEGB0106
            MOVE ID-NR-2  TO    ACC-NO.
            MOVE USER-CODE-2 TO USER-COD.
            MOVE USER-NR     TO USER-NMBR.
            MOVE DUR-2       TO DURATION.
            MOVE POS-26      TO BK-ALF1.
            MOVE  4  TO SUBS-IN   MOVE 1  TO SUBS-OUT.
            IF VARY-ITEM (4)  ¤ '0' OR    '9' NEXT SENTENCE ELSE
                 GO TO  LOOP-BOOK.
            MOVE VARY-ITEM  (4)  TO  BK-ALF2.
            ADD  1  TO  SUBS-IN.
            GO  TO  LOOP-BOOK.
```

FIGURE B.4, cont.

```
INTRNL NAME   LVL  SOURCE NAME                      BASE     DISPL  INTRNL NAME   DEFINITION     USAGE      R  O  Q
DNM 1-127     FD   IN-REC                           DCB 01          DNM 1-127                    QSAM
DNM 1-145     01   INPUT-REC-2                      BLI 1      000  DNM 1-145     DS 0CL80       GROUP
DNM 1-168     02   FILLER                           BLI 1      000  DNM 1-168     DS 5C          DISP
DNM 1-183     02   ID-NR-2                          BLI 1      005  DNM 1-183     DS 8C          DISP
DNM 1-199     02   FILLER                           BLI 1      00D  DNM 1-199     DS 2C          DISP
DNM 1-217     02   USER-CODE-2                      BLI 1      00F  DNM 1-217     DS 1C          DISP
DNM 1-237     02   USER-NR                          BLI 1      010  DNM 1-237     DS 7C          DISP
DNM 1-253     02   POS-24                           BLI 1      017  DNM 1-253     DS 1C          DISP
DNM 1-268     02   DUR-2                            BLI 1      018  DNM 1-268     DS 1C          DISP
DNM 1-282     02   POS-26                           BLI 1      019  DNM 1-282     DS 1C          DISP
DNM 1-297     02   FILLER                           BLI 1      01A  DNM 1-297     DS 54C         DISP
DNM 1-315     01   INPUT-REC                        BLI 1      000  DNM 1-315     DS 0CL80       GROUP
DNM 1-336     02   OUT-YR-DY                        BLI 1      000  DNM 1-336     DS 0CL4        GROUP
DNM 1-360     03   OUT-YR                           BLI 1      000  DNM 1-360     DS 1C          DISP
DNM 1-375     03   FILLER                           BLI 1      001  DNM 1-375     DS 3C          DISP
DNM 1-393     02   COL5-13-1                        BLI 1      004  DNM 1-393     DS 0CL9        GROUP
DNM 1-417     03   TYPER                            BLI 1      004  DNM 1-417     DS 1C          DISP
DNM 1-434     88   TYPE1                                            DNM 1-434
DNM 1-450     03   ACCESS-1                         BLI 1      005  DNM 1-450     DS 6C          DISP
DNM 1-467     03   FILLER                           BLI 1      00B  DNM 1-467     DS 2C          DISP
DNM 1-485     02   COL5-13-2                        BLI 1      004  DNM 1-485     DS 0CL9        GROUP      *
DNM 2-000     03   FILLER                           BLI 1      004  DNM 2-000     DS 3C          DISP
DNM 2-018     03   ACCESS-2                         BLI 1      007  DNM 2-018     DS 6C          DISP
DNM 2-035     02   USER-COD-IN                      BLI 1      00D  DNM 2-035     DS 1C          DISP
DNM 2-055     02   USER-NO                          BLI 1      00E  DNM 2-055     DS 7C          DISP
DNM 2-071     02   FILLER                           BLI 1      015  DNM 2-071     DS 1C          DISP
DNM 2-089     02   DUR-IN                           BLI 1      016  DNM 2-089     DS 1C          DISP
DNM 2-104     02   VARY-FLD                         BLI 1      017  DNM 2-104     DS 57C         DISP
DNM 2-121     02   REDEF-VARY                       BLI 1      017  DNM 2-121     DS 0CL57       GROUP      *
DNM 2-143     03   VARY-ITEM                        BLI 1      017  DNM 2-143     DS 1C          DISP          *
DNM 2-161     FD   OT-REC                           DCB 02          DNM 2-161                    QSAM
DNM 2-179     01   OUTPUT-REC                       BLI 2      000  DNM 2-179     DS 120C        DISP

DNM 2-213     77   FILLER                           BLI 3      000  DNM 2-213     DS 21C         DISP
DNM 2-231     77   SUBS-IN                          BLI 3      016  DNM 2-231     DS 1H          COMP
DNM 2-247     77   SUBS-OUT                         BLI 3      018  DNM 2-247     DS 1H          COMP
DNM 2-267     01   WK-OUT                           BLI 3      020  DNM 2-267     DS 0CL120      GROUP
DNM 2-285     02   FILLER                           BLI 3      020  DNM 2-285     DS 3C          DISP
DNM 2-303     02   BK-ALF1                          BLI 3      023  DNM 2-303     DS 1C          DISP
DNM 2-319     02   BK-ALF2                          BLI 3      024  DNM 2-319     DS 1C          DISP
DNM 2-338     02   BK-NUM                           BLI 3      025  DNM 2-338     DS 1C          DISP          *
DNM 2-353     02   ACC-NO                           BLI 3      02F  DNM 2-353     DS 6C          DISP
DNM 2-368     02   INSERT-YR                        BLI 3      035  DNM 2-368     DS 1C          DISP
DNM 2-386     02   OUT-DATE                         BLI 3      036  DNM 2-386     DS 4C          DISP
DNM 2-403     02   FILLER                           BLI 3      03A  DNM 2-403     DS 8C          DISP
DNM 2-421     02   DURATION                         BLI 3      042  DNM 2-421     DS 1C          DISP
DNM 2-441     02   FILLER                           BLI 3      043  DNM 2-441     DS 1C          DISP
DNM 2-459     02   USER-COD                         BLI 3      044  DNM 2-459     DS 1C          DISP
DNM 2-476     02   USER-NMBR                        BLI 3      045  DNM 2-476     DS 7C          DISP
DNM 2-494     02   FILLER                           BLI 3      04C  DNM 2-494     DS 8C          DISP
DNM 3-000     02   AUTH-TITLE                       BLI 3      054  DNM 3-000     DS 68C         DISP
DNM 3-019     02   REDEF-AUTH                       BLI 3      054  DNM 3-019     DS 0CL68       GROUP      *
DNM 3-041     03   SINGLE-AUTH                      BLI 3      054  DNM 3-041     DS 1C          DISP          *
DNM 3-061     01   STAT-LINE                        BLI 3      098  DNM 3-061     DS 0CL53       GROUP
DNM 3-082     02   FILLER                           BLI 3      098  DNM 3-082     DS 18C         DISP
```

FIGURE B.4, cont.

```
5

INTRNL NAME   LVL SOURCE NAME                     BASE    DISPL   INTRNL NAME   DEFINITION    USAGE      R  O  Q
DNM 3-100     02  CT-IN                           BLI 3     0AA   DNM 3-100     DS 6C         DISP-NM
DNM 3-117     02  FILLER                          BLI 3     0B0   DNM 3-117     DS 23C        DISP
DNM 3-135     02  CT-OT                           BLI 3     0C7   DNM 3-135     DS 6C         DISP-NM
```

B.3 Analysis of Circulation by Subject

Tables B.1 and B.2 present an analysis of circulations by subject for various libraries. All percentages are the result of sampling and are presented in both the Dewey Decimal and the Library of Congress classification systems. These tables could of course be consolidated by using the translation table discussed in Appendix A. Further analysis could be conducted by comparing these data with those given in Tables A.4 and A.6 dealing with book holdings. Some members of the research team intend to investigate this relationship, i.e. of percent of holdings versus percent of circulation more fully in the future.

B.4 Analysis of Circulation by Age

Table B.3 shows the distribution of circulation by age and by subject for the Washington State Library and the Seattle Public Library. This presentation results from analysis of the two samples of circulation described in section B.1. A comparison of this table with Table A.8, Age of Books in Collection, shows the marked effect of age of books on their circulation. It is interesting to note, however, that even though there are marked differences in median age of the two collections (from Table A.8) there is very little difference between the two libraries with regard to the median age of books in circulation. Figure B.5 presents the cumulative distribution function of age of books for the collection, circulation, and interlibrary loan requests received for the Washington State Library.

B.5 Circulation Rates and Analysis of Circulation Relative to Holdings

Tables B.4 through B.7 show the results of analysis of the sample of 1,490 books from the Washington State Library collection described in section B.1. "No of 0 Circs." is defined as the number of sample volumes published during the year shown in column 1 which did not circulate at all during the year under study (1968 or 1969).

Table B.8 is derived from the same sample of 1,490 volumes. Here the circulation of the volumes during years 1-10 after publication is shown. For example the circulations in year n + 1 included the circulation of books in 1968 which were published in 1967 as well as the circulations during 1962 of books published during 1961. In Figure B.6 the average annual circulation rates for n + 1 through n + 10 years are plotted.

The above provide evidence of the decreasing utilization of books with increasing age but reveal that those books which do circulate do so at a more or less constant rate except during the period shortly after publication. It is noteworthy also that, as Tables B.5 and B.7 show, approximately 80 percent of the titles which circulated at all did so only once or twice during the entire year.

Tables B.9 through B.12 and Figures B.7 and B.8 show the results of the computer analysis of circulation records for Central Washington State College Library and Bellingham Public Library. Again it is interesting to note the relatively small percentage of titles which circulated at all and the large percentage of titles which circulated only once or twice during the periods covered.

B.6 Length of Loan Period

Tables B.12 and B.13 show the results of analysis for length of actual circulation period for materials in the Seattle Public Library and the Washington State Library. The tables cover various types of printed materials.

TABLE B.1

PERCENT CIRCULATION BY SUBJECT -- DEWEY DECIMAL CLASSIFICATION

Library	000's	100's	200's	300's	400's	500's	600's	700's	800's	900's	Bio-graphy (920-9)	Fiction	Total	Sample Size	Total Annual Circulation
State Library	1.35	8.42	2.09	27.77	1.01	5.39	22.64	13.68	5.52	6.67	2.63	2.83	100.00	7,495	105,789
Seattle Public															
Adult	.32	5.06	2.14	9.80	.65	5.06	11.26	13.33	6.16	8.40	4.70	33.12	100.00	1,548	2,421,525
Juvenile	1.11	.16	.48	3.18	.64	5.72	2.23	2.70	1.75	3.18	4.93	73.94	100.00	629	1,425,567
Tacoma Public															
Adult	.22	2.19	1.53	11.69	.44	2.40	8.85	8.31	6.89	12.13	4.70	40.65	100.00	915	692,663
Juvenile	--	.23	.46	4.57	.46	3.42	1.60	6.39	.91	8.22	1.83	71.91	100.00	438	384,141
Yakima Valley Reg.															
Adult	.41	2.24	1.22	9.55	1.02	5.08	9.76	11.59	7.11	12.39	2.64	36.99	100.00	492	707,045
Juvenile	--	--	1.08	2.16	--	2.16	5.41	2.16	1.62	4.86	4.86	75.69	100.00	185	265,856
Kitsap County Reg.															
Adult	.61	2.91	1.09	5.63	.36	5.81	12.30	11.81	4.42	10.24	5.33	39.49	100.00	1,651	311,907
Puyallup Public															
Adult	.44	2.01	1.49	5.01	.22	2.21	7.24	6.32	17.93	9.36	4.17	43.60	100.00	43,676	64,080
Juvenile	1.33	.03	.42	4.60	.22	7.08	2.93	2.74	1.85	4.46	2.81	71.53	100.00	28,433	29,769
Wash. State Univ.(1)	1.20	7.62	2.40	26.15	.93	5.35	11.69	7.31	22.52	14.17	.66	--**	100.00	28,184	139,275
East.Wash.StateColl.(1)	.52	5.87	1.73	28.56	.26	7.85	13.55	11.82	14.92	14.92*	--	--**	100.00	1,159	96,356
West.Wash.StateColl.(1)	1.27	8.94	2.82	35.67	.68	10.56	7.74	9.22	6.64	16.00	.46	--**	100.00	8,677	50,372
Green River C.C.	1.06	9.48	3.66	15.59	1.18	12.04	11.24	12.03	14.36	19.36*	--	--**	100.00	8,330	12,513
Yakima Valley C.C.	.40	7.30	1.26	44.40	1.97	4.01	5.10	7.83	8.08	12.59	4.32	2.74	100.00	6,741	28,699

* Includes Biography
** Fiction included in 800's
(1) See "Percent Circulation by Subject -- Library of Congress Classification" for additional circulation for this library

TABLE B.2
PERCENT CIRCULATION BY SUBJECT -- LIBRARY OF CONGRESS CLASSIFICATION

LIBRARY	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
Wash.StateUniv.(1)	.13	8.57	.60	8.85	4.54	3.85	3.38	21.58	2.79	.23	1.61	.70	4.89	20.35	8.73
East.Wash.St.Coll.(1)	0.00	5.85	.53	4.79	5.32	3.19	1.60	11.70	.53	0.00	7.45	.53	4.79	18.62	26.06
Cent.Wash.St.Coll.	.08	9.24	.59	9.64	4.28	2.62	3.52	16.22	6.64	.31	9.03	2.01	5.75	11.82	9.00
West.Wash.St.Coll.(1)	.12	8.81	.36	7.49	5.28	1.97	5.19	14.80	3.03	.24	6.91	.89	4.25	24.01	9.63

LIBRARY	R	S	T	U	V	Z	TOTAL	SAMPLE SIZE	TOTAL ANNUAL CIRCULATION
Wash.StateUniv.(1)	3.57	.92	2.85	1.12	.12	.62	100.00	22,403	110,725(2)
East.Wash.St.Coll.(1)	5.32	.53	.53	0.00	0.00	2.66	100.00	188	15,634(2)
Cent.Wash.St.Coll.	2.69	.92	3.81	.42	.07	1.34	100.00	31,698	86,746(2)
West.Wash.St.Coll.(2)	2.53	.58	2.12	.31	.06	1.42	100.00	19,542	113,974

(1) See "Percent Circulation by Subject - Dewey Decimal Classification" for additional circulation for this library

(2) Represents annual circulation of books classified in Library of Congress classification

TABLE B.3

AGE OF BOOKS IN CIRCULATION -- SEATTLE PUBLIC LIBRARY AND WASHINGTON STATE LIBRARY

JANUARY 1970

SUBJECT	000's				100's				200's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. CIRC.	1.35		0.32		8.42		5.06		2.09		2.14	
MEDIAN AGE	1962		1961		1965		1965		1962		1959	
90% YEAR	1952		1959		1952		1952		1954		1908	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	12.00	12.00	0.00	0.00	8.82	8.82	11.54	11.54	11.11	11.11	3.03	3.03
1968	8.00	20.00	0.00	0.00	8.82	17.64	10.26	21.80	11.11	22.22	0.00	3.03
1967	12.00	32.00	40.00	40.00	11.76	29.40	12.82	34.62	7.41	29.63	6.06	9.09
1966	8.00	40.00	0.00	40.00	5.88	35.28	11.54	46.16	3.70	33.33	6.06	15.15
1965	4.00	44.00	0.00	40.00	14.71	49.99	6.41	52.57	0.00	33.33	0.00	15.15
1964	0.00	44.00	0.00	40.00	5.88	55.87	8.97	61.54	7.41	40.74	3.03	18.18
1963	4.00	48.00	0.00	40.00	2.94	58.81	2.56	64.10	3.70	44.44	12.12	30.30
1962	4.00	52.00	0.00	40.00	5.88	64.69	3.85	67.95	3.70	48.14	3.03	33.33
1961	8.00	60.00	20.00	60.00	4.41	69.10	6.41	74.36	11.11	59.25	6.06	39.39
1960	16.00	76.00	20.00	80.00	4.41	73.51	3.85	78.21	7.41	66.66	3.03	42.42
1959	4.00	80.00	20.00	100.00	4.41	77.92	1.28	79.49	0.00	66.66	3.03	45.45
1958	0.00	80.00	0.00	100.00	4.41	82.33	1.28	80.77	7.41	74.07	12.12	57.57
1957	0.00	80.00	0.00	100.00	1.47	83.80	2.56	83.33	7.41	81.48	6.06	63.63
1956	4.00	84.00	0.00	100.00	2.94	86.74	1.28	84.61	3.70	85.18	3.03	66.66
1955	0.00	84.00	0.00	100.00	0.00	86.74	1.28	85.89	0.00	85.18	3.03	69.69
1954	0.00	84.00	0.00	100.00	0.00	86.74	2.56	88.45	7.41	92.59	6.06	75.75
1953	4.00	88.00	0.00	100.00	1.47	88.21	1.28	89.73	0.00	92.59	0.00	75.75
1952	4.00	92.00	0.00	100.00	1.47	89.68	0.00	89.73	0.00	92.59	0.00	75.75
1951	0.00	92.00	0.00	100.00	1.47	91.15	1.28	91.01	0.00	92.59	0.00	75.75
1950	4.00	96.00	0.00	100.00	0.00	91.15	0.00	91.01	0.00	92.59	3.03	78.78
Before 1950	4.00	100.00	0.00	100.00	8.85	100.00	8.99	100.00	7.41	100.00	21.22	100.00

TABLE B.3, cont.
AGE OF BOOKS IN CIRCULATION -- SEATTLE PUBLIC LIBRARY AND WASHINGTON STATE LIBRARY

(continued)

SUBJECT	300's				400's				500's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY.	
% OF TOT. CIRC.	27.77		9.80		1.01		.65		5.39		5.06	
MEDIAN AGE	1967		1964		1964		1965		1964		1964	
90% YEAR	1959		1952		1941		1954		1945		1952	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	11.44	11.44	8.61	8.61	10.00	10.00	10.00	10.00	9.84	9.84	8.97	8.97
1968	26.37	37.81	13.91	22.52	20.00	30.00	20.00	30.00	11.48	21.32	10.26	19.23
1967	13.93	51.74	10.60	33.12	0.00	30.00	10.00	40.00	6.56	27.88	8.97	28.20
1966	5.97	57.71	3.31	36.43	10.00	40.00	0.00	40.00	8.20	36.08	7.69	35.89
1965	6.97	64.68	6.62	43.05	0.00	40.00	20.00	60.00	4.92	41.00	3.85	39.74
1964	4.48	69.16	7.95	51.00	10.00	50.00	10.00	70.00	8.20	49.20	14.10	53.84
1963	6.97	76.13	7.95	58.95	10.00	60.00	0.00	70.00	8.20	57.40	6.41	60.25
1962	2.49	78.62	6.62	65.57	10.00	70.00	0.00	70.00	4.92	62.32	5.14	65.39
1961	1.99	80.61	5.96	71.53	10.00	80.00	0.00	70.00	4.92	67.24	8.97	74.36
1960	5.97	86.58	3.31	74.84	0.00	80.00	0.00	70.00	4.92	72.16	2.56	76.92
1959	3.98	90.56	2.65	77.49	0.00	80.00	0.00	70.00	1.64	73.80	3.85	80.77
1958	1.00	91.56	3.31	80.80	0.00	80.00	0.00	70.00	3.28	77.08	2.56	83.33
1957	1.99	93.55	2.65	83.45	0.00	80.00	0.00	70.00	3.28	80.36	0.00	83.33
1956	1.99	95.54	1.32	84.77	0.00	80.00	0.00	70.00	1.64	82.00	2.56	85.89
1955	0.00	95.54	.66	85.43	0.00	80.00	10.00	80.00	1.64	83.64	1.28	87.17
1954	0.00	95.54	.66	86.09	0.00	80.00	10.00	90.00	1.64	85.28	1.28	88.45
1953	0.00	95.54	1.32	87.41	0.00	80.00	0.00	90.00	0.00	85.28	0.00	88.45
1952	1.00	96.54	1.32	88.73	0.00	80.00	0.00	90.00	0.00	85.28	1.28	89.73
1951	1.00	97.54	2.65	91.38	0.00	80.00	0.00	90.00	0.00	85.28	3.85	93.58
1950	0.00	97.54	.66	92.04	0.00	80.00	0.00	90.00	0.00	85.28	0.00	93.58
Before 1950	2.46	100.00	7.96	100.00	20.00	100.00	10.00	100.00	14.72	100.00	6.42	100.00

TABLE B.3, cont.

AGE OF BOOKS IN CIRCULATION -- SEATTLE PUBLIC LIBRARY AND WASHINGTON STATE LIBRARY

(continued)

SUBJECT	600's				700's				800's				900's			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. CIRC.	22.64		11.26		13.68		13.33		5.52		6.16		6.67		8.40	
MEDIAN AGE	1964		1964		1963		1963		1963		1962		1964		1964	
90% YEAR	1952		1947		1947		1943		1935		1937		1943		1947	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	9.69	9.69	5.71	5.71	3.62	3.62	7.73	7.73	5.63	5.63	9.47	9.47	11.67	11.67	10.69	10.69
1968	10.47	20.16	11.43	17.14	10.14	13.76	10.63	18.36	7.04	12.67	8.42	17.89	12.50	24.17	12.21	22.90
1967	9.69	29.85	6.86	24.00	8.70	22.46	6.76	25.12	14.08	26.75	10.53	28.42	5.00	29.17	8.40	31.30
1966	8.53	38.38	8.57	32.57	5.07	27.53	7.25	32.37	8.45	35.20	3.16	31.58	7.50	36.67	6.11	37.41
1965	5.43	43.81	9.14	41.71	10.14	37.67	4.35	36.72	5.63	40.83	4.21	35.79	10.00	46.67	8.40	45.81
1964	6.20	50.01	7.43	49.14	3.62	41.29	7.25	43.97	2.82	43.65	4.21	40.00	2.50	49.17	5.34	51.15
1963	7.36	57.37	6.86	56.00	8.70	49.99	5.80	49.77	8.45	52.10	7.37	47.37	2.50	51.67	2.29	53.44
1962	5.04	62.41	5.14	61.14	9.42	59.41	4.83	54.60	2.82	54.92	5.26	52.63	4.17	55.84	4.58	58.02
1961	4.65	67.06	4.00	65.14	4.35	63.76	3.38	57.98	5.63	60.55	5.26	57.89	1.67	57.51	5.34	63.36
1960	6.98	74.04	4.57	69.71	4.35	68.11	3.86	61.84	1.41	61.96	1.05	58.94	5.83	63.34	3.05	66.41
1959	3.88	77.92	2.29	72.00	.72	68.83	2.42	64.26	2.82	64.78	1.05	59.99	5.00	68.34	3.82	70.23
1958	2.71	80.63	1.14	73.14	2.90	71.73	1.45	65.71	2.82	67.60	2.11	62.10	.83	69.17	6.11	76.34
1957	1.55	82.18	1.14	74.28	3.62	75.35	5.31	71.02	2.82	70.42	3.16	65.26	2.50	71.67	3.05	79.39
1956	2.33	84.51	1.14	75.42	2.17	77.52	3.38	74.40	2.82	73.24	0.00	65.26	2.50	74.17	2.22	81.61
1955	1.94	86.45	4.57	79.99	2.17	79.69	2.42	76.82	2.82	76.06	2.11	67.37	3.33	77.50	.76	82.37
1954	1.55	88.00	2.29	82.28	3.62	83.31	1.93	78.75	1.41	77.47	1.05	68.42	1.67	79.17	2.29	84.66
1953	1.16	89.16	2.29	84.57	.72	84.03	1.45	80.20	0.00	77.47	3.16	71.58	.83	80.00	2.29	86.85
1952	1.55	90.71	1.71	86.28	2.17	86.20	.48	80.68	1.41	78.88	1.05	72.63	2.50	82.50	1.53	88.48
1951	1.16	91.87	.57	86.85	0.00	86.20	.48	81.16	1.41	80.29	0.00	72.63	0.00	82.50	.76	89.24
1950	.78	92.65	.57	87.42	.72	86.92	2.42	83.58	0.00	80.29	1.05	73.68	.83	83.33	0.00	89.24
Before 1950	7.35	100.00	12.58	100.00	13.08	100.00	16.42	100.00	19.71	100.00	26.32	100.00	16.67	100.00	10.76	100.00

TABLE B.3, cont.

AGE OF BOOKS IN CIRCULATION -- SEATTLE PUBLIC LIBRARY AND WASHINGTON STATE LIBRARY

(continued)

SUBJECT	BIOGRAPHY (+920-9)				FICTION				TOTAL			
LIBRARY	WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY		WASH. STATE LIBRARY		SEATTLE PUBLIC LIBRARY	
% OF TOT. CIRC.	2.63		4.70		2.83		33.12		100.00		100.00	
MEDIAN AGE	1963		1965		1964		1964		1964		1964	
90% YEAR	1928		1952		1950		1942		1950		1945	
YEAR	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %	%	CUM. %
1969	28.00	28.00	10.81	10.81	7.14	7.14	13.31	13.31	9.63	9.63	10.40	10.40
1968	0.00	28.00	17.57	28.38	0.00	7.14	7.83	21.14	13.16	22.79	10.21	20.61
1967	4.00	32.00	8.11	36.49	7.14	14.28	6.26	27.40	9.82	32.61	7.82	28.43
1966	0.00	32.00	4.05	40.54	0.00	14.28	5.87	33.27	6.78	39.39	6.33	34.76
1965	0.00	32.00	8.11	48.65	7.14	21.42	8.81	42.08	7.17	46.56	7.17	41.93
1964	4.00	36.00	9.46	58.11	0.00	21.42	6.07	48.15	4.72	51.28	7.04	48.97
1963	16.00	52.00	5.41	63.52	0.00	21.42	4.89	53.04	6.68	57.96	5.56	54.53
1962	4.00	56.00	2.70	66.22	0.00	21.42	3.33	56.37	4.81	62.77	4.33	58.86
1961	0.00	56.00	5.41	71.63	0.00	21.42	2.74	59.11	3.93	66.70	4.39	63.25
1960	4.00	60.00	1.35	72.98	0.00	21.42	3.91	63.02	5.60	72.30	3.49	66.74
1959	4.00	64.00	4.05	77.03	0.00	21.42	2.35	65.37	3.24	75.54	2.58	69.32
1958	4.00	68.00	1.35	78.38	0.00	21.42	4.11	69.48	2.36	77.90	3.17	72.49
1957	0.00	68.00	1.35	79.73	7.14	28.56	2.54	72.02	2.36	80.26	2.71	75.20
1956	0.00	68.00	2.70	82.43	0.00	28.56	1.96	73.98	2.26	82.52	1.94	77.14
1955	4.00	72.00	0.00	82.43	14.29	42.85	2.54	76.52	1.77	84.29	2.20	79.34
1954	4.00	76.00	2.70	85.13	0.00	42.85	1.96	78.48	1.57	85.86	2.00	81.34
1953	0.00	76.00	1.35	86.48	0.00	42.85	1.76	80.24	.69	86.55	1.68	83.02
1952	0.00	76.00	4.05	90.53	7.14	49.99	1.37	81.61	1.57	88.12	1.29	84.31
1951	0.00	76.00	2.70	93.23	0.00	49.99	.78	82.39	.69	88.81	1.03	85.34
1950	4.00	80.00	1.35	94.58	7.14	57.13	1.17	83.56	.69	89.50	1.03	86.37
Before 1950	20.00	100.00	5.42	100.00	42.87	100.00	16.44	100.00	10.50	100.00	13.63	100.00

TABLE B.4
WASHINGTON STATE LIBRARY
1969 CIRCULATIONS
HOLDINGS BY YEAR vs. CIRCULATION IN 1969
SAMPLE OF 1,490 VOLUMES

1	2	3	4	5	6	7	8
Year of Pub.	Volumes in Sample	No. of 0 Circs.	% of 0 Circs.	Titles Circd.	Total Circs.	Ave.Rate of Circ. 6/2	Circ. Rate 6/5
1970	(17)	--	--	--	--	--	--
1969	145	124	.8552	21	47	.3241	2.2381
1968	151	86	.5695	65	148	.9801	2.2769
1967	130	77	.5923	53	105	.8077	1.9811
1966	60	37	.6167	23	47	.7833	2.0435
1965	70	45	.6429	25	48	.6857	1.9200
1964	70	46	.6571	24	44	.6286	1.8333
1963	65	43	.6615	22	35	.5385	1.5909
1962	64	41	.6406	23	47	.7344	2.0435
1961	69	55	.7971	14	19	.2754	1.3571
1960	60	44	.7333	16	22	.3667	1.3750
1959	55	36	.6545	19	21	.3818	1.1053
1958	45	32	.7111	13	27	.6000	2.0769
1957	35	25	.7143	10	14	.4000	1.4000
1956	48	34	.7083	14	34	.7083	2.4286
1955	41	23	.5610	18	30	.7317	1.6667
1954	26	21	.8077	5	6	.2308	1.2000
1953	16	12	.7500	4	7	.4375	1.7500
1952	21	16	.7619	5	6	.2857	1.2000
1951	19	13	.6842	6	7	.3684	1.1667
1950	17	10	.5882	7	9	.5294	1.2857
1949	13	11	.8462	2	4	.3077	2.0000
1948	10	7	.7000	3	3	.3000	1.0000
1947	12	11	.9167	1	2	.1667	2.0000
1946	16	13	.8125	3	6	.3750	2.0000
1945	15	12	.8000	3	7	.4667	2.3333
1944	7	5	.7143	2	3	.4286	1.5000
1943	13	7	.5385	6	6	.4615	1.0000
1942	17	13	.7647	4	11	.6471	2.7500
1941	8	5	.6250	3	4	.5000	1.3333
1940	6	6	1.0000	0	0	.0000	--
1939	9	6	.6667	3	5	.5556	1.6667
1938	7	7	1.0000	0	0	.0000	--
1937	8	5	.6250	3	3	.3750	1.0000
1936	4	1	.2500	3	3	.7500	1.0000

TABLE B.4, cont.:
WASHINGTON STATE LIBRARY -- 1969 CIRCULATIONS, cont.:

1	2	3	4	5	6	7	8
Year of Pub.	Volumes in Sample	No. of 0 Circs.	% of 0 Circs.	Titles Circd.	Total Circs.	Ave.Rate of Circ. 6/2	Circ. Rate 6/5
1935	5	4	.8000	1	1	.2000	1.0000
1934	4	4	1.0000	0	0	.0000	--
1933	4	4	1.0000	0	0	.0000	--
1932	1	1	1.0000	0	0	.0000	--
1931	2	2	1.0000	0	0	.0000	--
1930	2	2	1.0000	0	0	.0000	--
1929	12	9	.7500	3	3	.2500	1.0000
1928	2	1	.5000	1	1	.5000	1.0000
1927	9	6	.6667	3	3	.3333	1.0000
1926	7	7	1.0000	0	0	.0000	--
1925	5	5	1.0000	0	0	.0000	--
1924	1	1	1.0000	0	0	.0000	--
1923	3	3	1.0000	0	0	.0000	--
1922	3	3	1.0000	0	0	.0000	--
1921	5	5	1.0000	0	0	.0000	--
1920	3	2	.6667	1	1	.3333	1.0000
1919	3	3	1.0000	0	0	.0000	--
1918	3	3	1.0000	0	0	.0000	--
1917	1	1	1.0000	0	0	.0000	--
1916	3	3	1.0000	0	0	.0000	--
1915	3	3	1.0000	0	0	.0000	--
1914	0	--	--	--	--	--	--
1913	3	2	.6667	1	1	.3333	1.0000
1912	3	2	.6667	1	1	.3333	1.0000
1911	2	1	.5000	1	1	.5000	1.0000
1910	4	3	.7500	1	1	.2500	1.0000
1909	1	0	.0000	1	1	1.0000	1.0000
1908	3	3	1.0000	0	0	.0000	--
1907	2	2	1.0000	0	0	.0000	--
1906	4	3	.7500	1	1	.2500	1.0000
1905	0	--	--	--	--	--	--
1904	2	2	1.0000	0	0	.0000	--
1903	0	--	--	--	--	--	--
1902	0	--	--	--	--	--	--
1901	2	2	1.0000	0	0	.0000	--
1900	2	2	1.0000	0	0	.0000	--
Bef.1900	12	6	.5000	6	7	.5833	1.1667
TOTALS:	1,490	1,029	.6641[1]	444	802	.5684[1]	1.7938[1]

[1] Calculated on 1960-68 data.

TABLE B.5
WASHINGTON STATE LIBRARY
ANALYSIS OF VOLUMES WHICH CIRCULATED DURING 1969
NUMBER OF TIMES EACH TITLE CIRCULATED
(Sample of 1490 Volumes)

No. of Times Circulated	Volumes Circulated	Proportion of all Volumes	Cumulative Distribution
1	277	.6239	.6239
2	85	.1914	.8153
3	40	.0901	.9054
4	18	.0405	.9459
5	6	.0135	.9594
6	6	.0135	.9729
7	7	.0158	.9887
8	0	.0000	.9887
9	3	.0068	.9955
10	2	.0045	1.0000
TOTALS:	444	1.0000	

TABLE B.6
WASHINGTON STATE LIBRARY
1968 CIRCULATIONS
HOLDINGS BY YEAR vs. CIRCULATION IN 1968
SAMPLE OF 1,490 VOLUMES

1 Year of Pub.	2 Volumes in Sample	3 No. of 0 Circs.	4 % of 0 Circs.	5 Titles Circd.	6 Total Circs.	7 Ave.Rate of Circ. 6/2	8 Circ. Rate 6/5
1970	(17)	--	--	--	--	--	--
1969	(145)	--	--	--	--	--	--
1968	151	130	86.09	21	41	.2715	1.9524
1967	130	66	50.77	64	105	.8077	1.6406
1966	60	39	65.00	21	43	.7167	2.0476
1965	70	45	64.29	25	48	.6857	1.9200
1964	70	47	67.14	23	44	.6286	1.9130
1963	65	43	66.15	22	36	.5538	1.6364
1962	64	38	59.38	26	45	.7031	1.7308
1961	69	51	73.91	18	39	.5652	2.1667
1960	60	44	73.33	16	30	.5000	1.8750
1959	55	43	78.18	12	17	.3091	1.4167
1958	45	31	68.89	14	16	.3556	1.1429
1957	35	24	68.57	11	18	.5143	1.6364
1956	48	28	58.33	20	35	.7292	1.7500
1955	41	28	68.29	13	20	.4878	1.5385
1954	26	18	69.23	8	12	.4615	1.5000
1953	16	11	68.75	5	8	.5000	1.6000
1952	21	18	85.71	3	3	.1429	1.0000
1951	19	15	78.95	4	10	.5263	2.5000
1950	17	14	82.35	3	4	.2353	1.3333
1949	13	10	76.92	3	3	.2308	1.0000
1948	10	8	80.00	2	2	.2000	1.0000
1947	12	9	75.00	3	4	.3333	1.3333
1946	16	11	68.75	5	11	.6875	2.2000
1945	15	11	73.33	4	6	.4000	1.5000
1944	7	4	57.14	3	4	.5714	1.3333
1943	13	10	76.92	3	4	.3077	1.3333
1942	17	12	70.59	5	7	.4118	1.4000
1941	8	6	75.00	2	3	.3750	1.5000
1940	6	4	66.67	2	3	.5000	1.5000
1939	9	6	66.67	3	10	1.1111	3.3333
1938	7	5	71.43	2	3	.4286	1.5000
1937	8	6	75.00	2	6	.7500	3.0000
1936	4	4	100.00	0	0	.0000	--

TABLE B.6, cont.:
WASHINGTON STATE LIBRARY -- 1968 CIRCULATIONS, cont.:

1 Year of Pub.	2 Volumes in Sample	3 No. of 0 Circs.	4 % of 0 Circs.	5 Titles Circd.	6 Total Circs.	7 Ave.Rate of Circ. 6/2	8 Circ. Rate 6/5
1935	5	4	80.00	1	1	.2000	1.0000
1934	4	3	75.00	1	1	.2500	1.0000
1933	4	4	100.00	0	0	.0000	--
1932	1	1	100.00	0	0	.0000	--
1931	2	1	50.00	1	1	.5000	1.0000
1930	2	2	100.00	0	0	.0000	--
1929	12	12	100.00	0	0	.0000	--
1928	2	1	50.00	1	1	.5000	1.0000
1927	9	5	55.55	4	5	.5555	1.2500
1926	7	6	85.71	1	1	.1429	1.0000
1925	5	4	80.00	1	2	.4000	2.0000
1924	1	1	100.00	0	0	.0000	--
1923	3	3	100.00	0	0	.0000	--
1922	3	3	100.00	0	0	.0000	--
1921	5	5	100.00	0	0	.0000	--
1920	3	3	100.00	0	0	.0000	--
1919	3	3	100.00	0	0	.0000	--
1918	3	3	100.00	0	0	.0000	--
1917	1	1	100.00	0	0	.0000	--
1916	3	3	100.00	0	0	.0000	--
1915	3	3	100.00	0	0	.0000	--
1914	0	--	--	0	0	--	--
1913	3	2	66.67	1	1	.3333	1.0000
1912	3	3	100.00	0	0	.0000	--
1911	2	2	100.00	0	0	.0000	--
1910	4	4	100.00	0	0	.0000	--
1909	1	1	100.00	0	0	.0000	--
1908	3	3	100.00	0	0	.0000	--
1907	2	2	100.00	0	0	.0000	--
1906	4	2	50.00	2	3	.7500	1.5000
1905	0	--	--	0	0	--	--
1904	2	2	100.00	0	0	.0000	--
1903	0	--	--	0	0	--	--
1902	0	--	--	0	0	--	--
1901	2	1	50.00	1	1	.5000	1.0000
1900	2	2	100.00	0	0	.0000	--
Bef.1900	12	10	83.33	2	3	.2500	1.5000
TOTALS:	1,490	944	69.53[1]	384	660	.5236[1]	1.6898[1]

[1] Calculated on 1960-67 data.

TABLE B.7
WASHINGTON STATE LIBRARY
ANALYSIS OF VOLUMES WHICH CIRCULATED DURING 1968
NUMBER OF TIMES EACH TITLE CIRCULATED
(Sample of 1,490 Volumes)

No. of Times Circulated	Volumes Circulated	Proportion of all Volumes	Cumulative Distribution
1	216	.5625	.5625
2	87	.2266	.7891
3	50	.1302	.9193
4	16	.0417	.9610
5	8	.0208	.9818
6	6	.0156	.9974
7	1	.0026	1.0000
TOTALS	384	1.0000	

TABLE B.8
WASHINGTON STATE LIBRARY
CIRCULATION RATES OF VOLUMES IN YEARS 1-10 AFTER PUBLICATION
SAMPLE OF 1,490 VOLUMES

(1) Rate of Circulation for Class of Books. (2) Rate of Circulation of Those Volumes Which Circulated One or More Times.

CLASS	CATEGORY	YEAR N+1	YEAR N+2	YEAR N+3	YEAR N+4	YEAR N+5	YEAR N+6	YEAR N+7	YEAR N+8	YEAR N+9	YEAR N+10	TOTALS & AVERAGES
000's	Volumes	41	39	36	31	31	26	26	26	20	18	294
	Volumes Circ'd	5	8	4	4	4	3	3	5	2	1	39
	% Which Circ'd	12.20	20.51	11.11	12.90	12.90	11.54	11.54	19.23	10.00	5.56	13.27
	Total Circ.	14	13	7	7	7	6	5	5	2	1	67
	(1)Rate of Circ.	.3415	.3333	.1944	.2258	.2258	.2308	.1923	.1923	.1000	.0556	.2279
	(2)Rate of Circ.	2.80000	1.4444	1.6250	1.75	1.75	1.75	2.0	1.0000	1.0	1.0	1.7179
100's	Volumes	56	50	43	42	39	34	30	27	23	20	364
	Volumes Circ'd	19	11	12	10	5	8	6	4	5	7	87
	% Which Circ'd	33.93	22.00	27.91	23.81	12.82	23.53	20.00	14.81	21.74	35.00	.2390
	Total Circ.	57	42	23	20	17	16	18	7	15	23	238
	(1)Rate of Circ.	1.0179	.8400	.5349	.4762	.4359	.4706	.6000	.2593	.6522	1.1500	.6538
	(2)Rate of Circ.	3.0	.8400	1.9167	2.0	3.40	2.0	2.0	1.75	3.0	3.2857	2.7356
200's	Volumes	32	29	27	27	26	25	25	25	19	19	254
	Volumes Circ'd	9	5	6	5	7	2	5	5	2	3	49
	% Which Circ'd	28.13	17.24	22.22	18.52	26.92	8.00	20.00	20.00	10.53	15.79	.1929
	Total Circ.	27	8	10	11	8	5	11	6	3	3	92
	(1)Rate of Circ.	.8438	.2759	.3704	.4074	.3077	2000	.4400	.2400	.1579	.1579	.3622
	(2)Rate of Circ.	3.0	1.60	1.6667	2.2	1.14	2.50	2.2	1.20	1.50	1.0	1.8776
300's	Volumes	325	281	241	220	203	181	168	153	143	124	2039
	Volumes Circ'd	104	78	67	43	38	40	30	24	22	17	463
	% Which Circ'd	32.00	27.75	27.80	19.55	18.72	22.10	17.86	15.69	15.38	13.71	.2271
	Total Circ.	308	230	148	115	80	75	64	38	40	25	1123
	(1)Rate of Circ.	.9477	.8185	.6141	.5227	.3941	.4144	.3810	.2484	.2797	.2016	.5508
	(2)Rate of Circ.	2.9615	.8185	2.2090	2.6744	2.1053	1.8750	2.1333	1.5833	1.8182	1.4706	2.4255

TABLE B.8, cont.
WASHINGTON STATE LIBRARY
CIRCULATION RATES OF VOLUMES IN YEARS 1-10 AFTER PUBLICATION

CLASS	CATEGORY	YEAR N+1	YEAR N+2	YEAR N+3	YEAR N+4	YEAR N+5	YEAR N+6	YEAR N+7	YEAR N+8	YEAR N+9	YEAR N+10	TOTALS & AVERAGES
400's	Volumes	10	9	8	8	8	8	6	5	5	3	70
	Volumes Circ'd	2	3	4	1	2	3	3	0	0	0	18
	% Which Circ'd	20.00	33.33	50.00	12.50	25.00	37.50	50.00	00.00	00.00	00.00	.2571
	Total Circ.	4	3	4	1	4	5	3	0	0	0	24
	(1)Rate of Circ.	.4000	.3333	.5000	.1250	.5000	.6250	.5000	.0000	.0000	.0000	.3429
	(2)Rate of Circ.	2.0	1.0	1.0	1.0	2.0	1.6667	1.0	0	0	0	1.3333
500's	Volumes	92	83	73	65	64	60	55	53	46	42	633
	Volumes Circ'd	34	21	15	10	14	9	5	5	3	3	119
	% Which Circ'd	36.96	25.30	20.55	15.38	21.88	15.00	9.09	9.43	6.52	7.14	.1880
	Total Circ.	77	52	28	20	23	17	5	12	9	8	251
	(1)Rate of Circ.	.8370	.6265	.3836	.3077	.3594	.2833	.0727	.2264	.1957	.1905	.3965
	(2)Rate of Circ.	2.2647	2.4762	1.8667	2.0	1.6429	1.8889	1.0	2.40	3.0	2.6667	2.1092
600's	Volumes	260	235	212	204	178	165	148	134	114	104	1754
	Volumes Circ'd	94	72	59	50	37	31	26	28	19	25	441
	% Which Circ'd	36.15	30.64	27.83	24.51	20.79	18.79	17.57	20.90	16.67	24.04	.2514
	Total Circ.	217	186	156	94	47	72	50	65	30	43	960
	(1)Rate of Circ.	.8346	.7915	.7358	.4608	.2640	.4364	.3378	.4851	.2632	.4135	.5473
	(2)Rate of Circ.	2.3085	2.5833	2.6441	1.880	1.27	2.3226	1.9231	2.3214	1.5789	1.7200	2.1769
700's	Volumes	126	115	98	91	82	79	70	60	58	53	832
	Volumes Circ'd	41	38	33	34	22	18	15	8	6	5	220
	% Which Circ'd	32.54	33.04	33.67	37.36	26.83	22.78	21.43	13.33	10.34	9.43	.2644
	Total Circ.	92	72	90	57	43	29	40	28	25	17	493
	(1)Rate of Circ.	.7302	.6261	.9184	.6264	.5244	.3671	.5714	.4667	.4310	.3208	.5925
	(2)Rate of Circ.	2.2439	1.8947	2.7273	1.6765	1.9545	1.6111	2.6667	3.5000	4.1667	3.40	2.2409

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TABLE B.8 cont.
WASHINGTON STATE LIBRARY
CIRCULATION RATES OF VOLUMES IN YEARS 1-10 AFTER PUBLICATION

CLASS	CATEGORY	YEAR N+1	YEAR N+2	YEAR N+3	YEAR N+4	YEAR N+5	YEAR N+6	YEAR N+7	YEAR N+8	YEAR N+9	YEAR N+10	TOTALS & AVERAGES
800's	Volumes	109	99	84	80	76	71	64	60	55	49	747
	Volumes Circ'd	25	21	11	10	12	9	6	3	8	4	109
	% Which Circ'd	22.94	21.21	13.10	12.50	15.79	12.68	9.38	5.00	14.55	8.16	.1459
	Total Circ.	54	34	18	19	17	23	16	7	15	7	210
	(1)Rate of Circ.	.4954	.3434	.2143	.2375	.2237	.3239	.2500	.1167	.2727	.1429	.2811
	(2)Rate of Circ.	2.16	1.6190	1.6364	1.90	1.4167	2.5555	2.6667	2.3333	1.8750	1.7500	1.9266
900's	Volumes	193	168	155	145	153	133	120	115	104	94	1380
	Volumes Circ'd	57	46	31	30	44	26	22	19	18	18	311
	% Which Circ'd	29.53	27.38	20.00	20.69	28.76	19.55	18.33	16.52	17.31	19.15	.2254
	Total Circ.	236	106	73	66	69	55	42	40	32	25	744
	(1)Rate of Circ.	1.2228	.6310	.4710	.4552	.4510	.4135	.3500	.3478	.3077	.2660	.5391
	(2)Rate of Circ.	4.1404	2.3043	2.3548	2.20	1.5682	2.1154	1.9091	2.1053	1.7778	1.3889	2.3923
Biog.	Volumes	72	67	64	62	59	58	54	51	48	45	580
	Volumes Circ'd	21	19	11	11	6	5	4	5	1	5	88
	% Which Circ'd	29.17	28.36	17.19	17.74	10.17	8.62	7.41	9.80	2.08	11.11	.1517
	Total Circ.	47	40	20	20	9	18	8	9	4	11	186
	(1)Rate of Circ.	.6528	.5970	.3125	.3225	.1525	.3103	.1481	.1765	.0833	.2444	.3207
	(2)Rate of Circ.	2.2381	2.1053	1.8182	1.8182	1.50	3.60	2.0	1.80	4.0	2.20	2.1136
Fiction	Volumes	32	31	30	30	30	30	30	30	30	29	302
	Volumes Circ'd	7	5	3	4	4	6	5	4	2	5	45
	% Which Circ'd	21.88	16.13	10.00	13.33	13.33	20.00	16.67	13.33	6.67	17.24	.1490
	Total Circ.	18	14	7	16	12	16	7	7	10	15	122
	(1)Rate of Circ.	.5625	.4516	.2333	.5333	.4000	.5333	.2333	.2333	.3333	.5172	.4040
	(2)Rate of Circ.	2.5714	2.80	2.3333	4.0	3.0	2.6667	1.40	1.75	5.0	3.0	2.7111
TOTALS	Volumes	1348	1206	1071	1005	949	870	796	739	665	600	9249
	Volumes Circ'd	418	327	256	212	195	160	130	110	88	93	1989
	% Which Circ'd	31.01	27.11	23.90	21.09	20.55	18.39	16.33	14.88	13.23	15.50	.2151
	Total Circ.	1151	800	584	446	336	337	269	224	185	178	.4510
	(1)Rate of Circ.	.8539	.6633	.5453	.4438	.3541	.3874	.3379	.3031	.2782	.2967	.4876
	(2)Rate of Circ.	2.7536	2.4465	2.2813	2.1038	1.7231	2.1063	2.0692	2.0364	2.1023	1.9140	2.2675

TABLE B.9
CENTRAL WASHINGTON STATE COLLEGE LIBRARY

SUBJECT ANALYSIS OF BOOK CIRCULATIONS;
January 2, 1968 - June 30, 1969

Subject Class	Titles Avail.	% of Total Titles	Titles Which Circulated	% of Titles Circulated	Circ. in Vols.	% of Total Circ.
A	917	0.97	25	0.08	47	0.06
B	6,215	6.54	2,876	9.31	8,095	10.74
C	505	0.53	182	0.59	325	0.43
D	7,728	8.13	3,010	9.75	6,834	9.07
E	3,555	3.74	1,313	4.25	2,741	3.64
F	2,905	3.06	819	2.65	1,490	1.98
G	2,519	2.68	1,096	3.55	2,770	3.68
H	12,558	13.22	5,053	16.37	14,743	19.56
J	3,134	3.30	921	2.98	1,974	2.62
K	642	0.68	98	0.32	176	0.23
L	8,278	8.71	2,765	8.96	8,574	11.38
M	3,340	3.52	632	2.05	1,362	1.81
N	3,868	4.07	1,788	5.79	4,596	6.10
P	19,413	20.44	4,576	14.82	8,741	11.60
Q	10,188	10.73	2,748	8.90	6,126	8.13
R	2,049	2.16	884	2.86	2,197	2.92
S	620	0.65	294	0.95	661	0.88
T	3,020	3.18	1,215	3.94	2,770	3.68
U	199	0.21	132	0.43	259	0.34
V	42	0.05	21	0.07	37	0.05
Z	3,274	3.43	428	1.38	847	1.12
Totals	94,969	100.00	30,876	100.00	75,365	100.02

32.51% of available titles circulated

TABLE B.10
CENTRAL WASHINGTON STATE COLLEGE LIBRARY

ANALYSIS OF TITLES WHICH CIRCULATED
January 2, 1968 - June 30, 1969

No. of Times Circulated	No. of Titles Circulated	Proportion of all Titles	Cumulative Distribution
1	14,225	.4607	.4607
2	6,871	.2225	.6832
3	3,720	.1205	.8037
4	2,140	.0693	.8730
5	1,335	.0432	.9162
6	849	.0275	.9437
7	541	.0175	.9612
8	359	.0116	.9728
9	237	.0077	.9805
10	139	.0045	.9850
11	113	.0037	.9887
12	98	.0032	.9919
13	54	.0017	.9936
14	+2	.0014	.9950
15	28	.0009	.9959
16	21	.0007	.9966
17	18	.0006	.9972
18	17	.0006	.9978
19	8	.0003	.9981
20	5	.0002	.9983
21	5	.0002	.9985
22	9	.0003	.9988
23	1	.0000	.9988
24	3	.0001	.9989
25	38	.0012	1.0001
Total	30,876		

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TABLE B. 11
BELLINGHAM PUBLIC LIBRARY

SUBJECT ANALYSIS OF BOOK CIRCULATIONS;
January 2, 1970 - March 31, 1970

Subject Class	Titles Avail.	% of Total Titles	Titles Which Circulated	% of Titles Circulated	Circ. in Vols.	% of Total Circulation
000's	731	0.82	412	1.19	595	0.53
100's	1,373	1.55	777	2.24	2,358	2.11
200's	2,141	2.41	843	2.43	1,640	1.47
300's	7,823	8.81	3,157	9.09	7,522	6.72
400's	697	0.79	178	0.51	379	0.34
500's	4,822	5.43	1,704	4.91	4,218	3.77
600's	8,586	9.67	4,558	13.13	12,515	11.19
700's	6,899	7.77	3,401	9.79	8,833	7.89
800's	8,177	9.21	2,529	7.28	4,594	4.11
900's	19,421	21.88	5,352	15.41	12,918	11.55
Fiction	28,099	31.65	11,813	34.02	56,311	50.33
TOTALS	88,769	99.99	34,724	100.00	111,833	100.01

39.12% of available titles circulated

TABLE B.12
BELLINGHAM PUBLIC LIBRARY

ANALYSIS OF TITLES WHICH CIRCULATED BETWEEN January 2, 1970 and March 31, 1970

No. of Times Circulated	No. of Titles Circulated	Proportion of all Titles	Cumulative Distribution
1	12,618	.3617	.3617
2	7,662	.2197	.5814
3	4,837	.1387	.7201
4	2,962	.0849	.8050
5	1,892	.0542	.8592
6	1,231	.0353	.8945
7	871	.0250	.9195
8	593	.0170	.9365
9	429	.0123	.9488
10	358	.0103	.9591
11	278	.0080	.9671
12	180	.0052	.9723
13	163	.0047	.9770
14	130	.0037	.9807
15	94	.0027	.9834
16	89	.0026	.9860
17	76	.0022	.9882
18	54	.0015	.9897
19	49	.0014	.9911
20	53	.0015	.9926
21	37	.0011	.9937
22	31	.0009	.9946
23	27	.0008	.9954
24	17	.0005	.9959
25 or more	151	.0043	1.0002
Totals	34,882		

TABLE B. 13
SEATTLE PUBLIC LIBRARY

CIRCULATION PERIODS (ACTUAL) FOR MATERIALS
SAMPLE OF 2,460 ITEMS RETURNED IN APRIL 1970

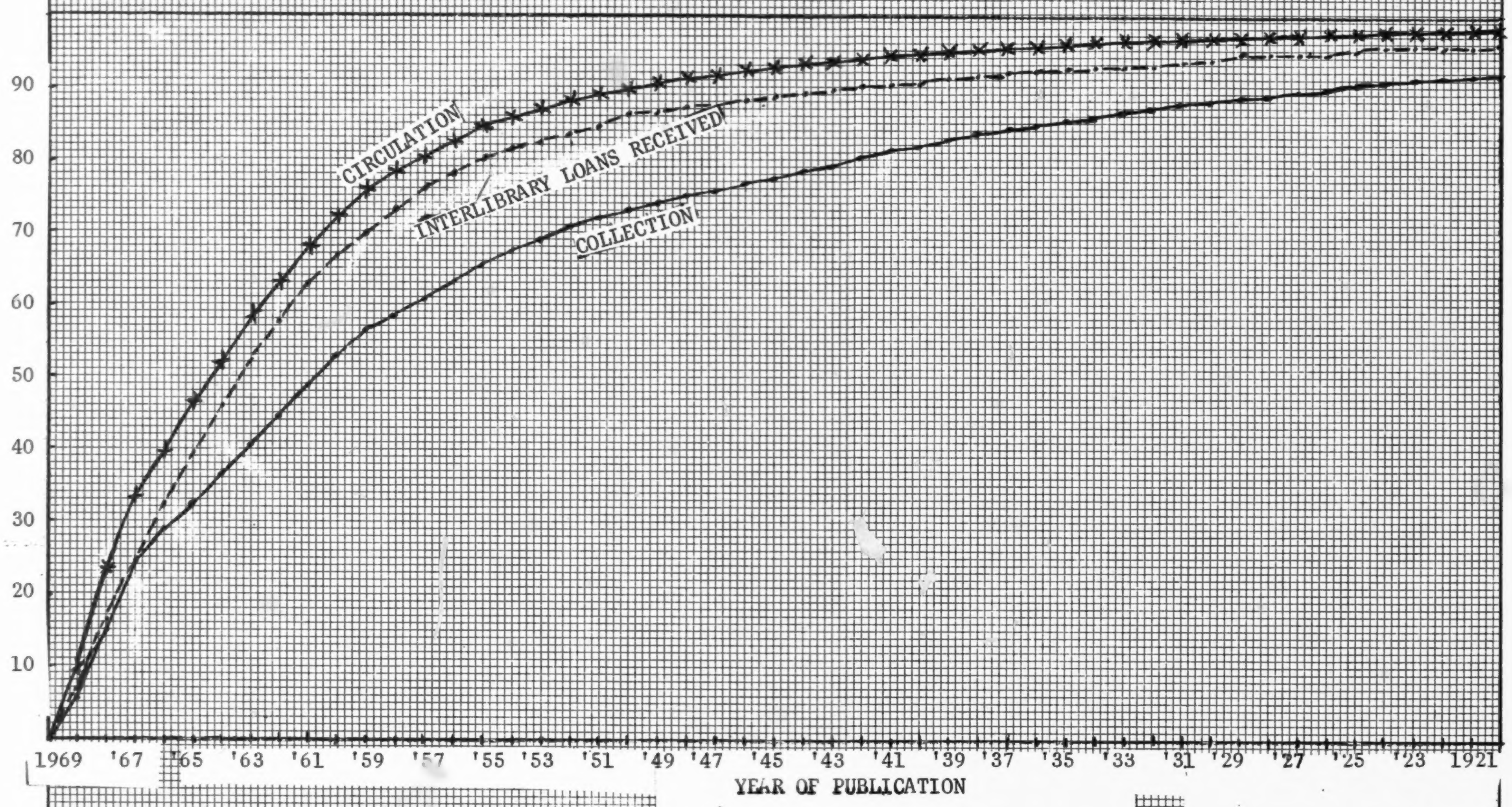
	4-Week Books	%	2-Week Books	%	2-Week Periodicals	%
No. in Sample	1,845	78.18%	363	15.38%	152	6.44%
Average Days in Circulation:						
Mean		23.87		14.31	15.23	
Median		27.50		15.0	16	
Mode		28.0		16.0	17	
Range		1-83		1-46	1-46	
Length of Circulation (Days)						
1-14	457	24.77	191	52.62	71	46.71
15-27	522	28.29	148	40.77	69	45.39
28-35	717	38.86	18	4.96	8	5.27
36-42	85	4.61	2	0.55	0	---
43-49	34	1.84	4	1.10	4	2.63
50 or more	30	1.63	0	---	0	---
TOTALS	1,845	100.00	363	100.00	252	100.00

TABLE B. 14
WASHINGTON STATE LIBRARY

CIRCULATION PERIODS (ACTUAL) FOR MATERIALS
SAMPLE OF 1,121 ITEMS RETURNED IN FEBRUARY 1970

	4-Week Books	%	2-Week Books	%	Periodicals (2 weeks)	%	Documents (4 weeks)	%
No. in Sample	998	89.03%	25	2.23%	52	4.64%	46	4.10%
Average Days in Circulation:								
Mean	29.2		21.8		16.1		21.0	
Median	28.0		23.0		14.0		22.0	
Mode	28.0		24.5		15.0		2.0	
Range (days)	1-178		1-56		1-38		1-51	
Length of Circulation: (Days)								
1-27	520	52.10%	7	28.00%	26	50.00%	26	56.52%
28-35	246	24.65%	4	16.00%	12	23.08%	11	23.91%
36-42	89	8.92%	10	40.00%	5	9.62%	2	4.35%
43-49	73	7.31%	3	12.00%	7	13.46%	6	13.04%
50-83	49	4.91%	1	4.00%	2	3.85%	1	2.17%
84 and more	21	2.10%	0	0.00%	0	0.00%	0	0.00%
TOTAL	998	99.99%	25	100.00%	52	100.01%	46	99.99%

FIGURE B.5
WASHINGTON STATE LIBRARY
CIRCULATION, INTERLIBRARY LOANS AND BOOK COLLECTION AS A FUNCTION OF AGE
(From Various Samples)



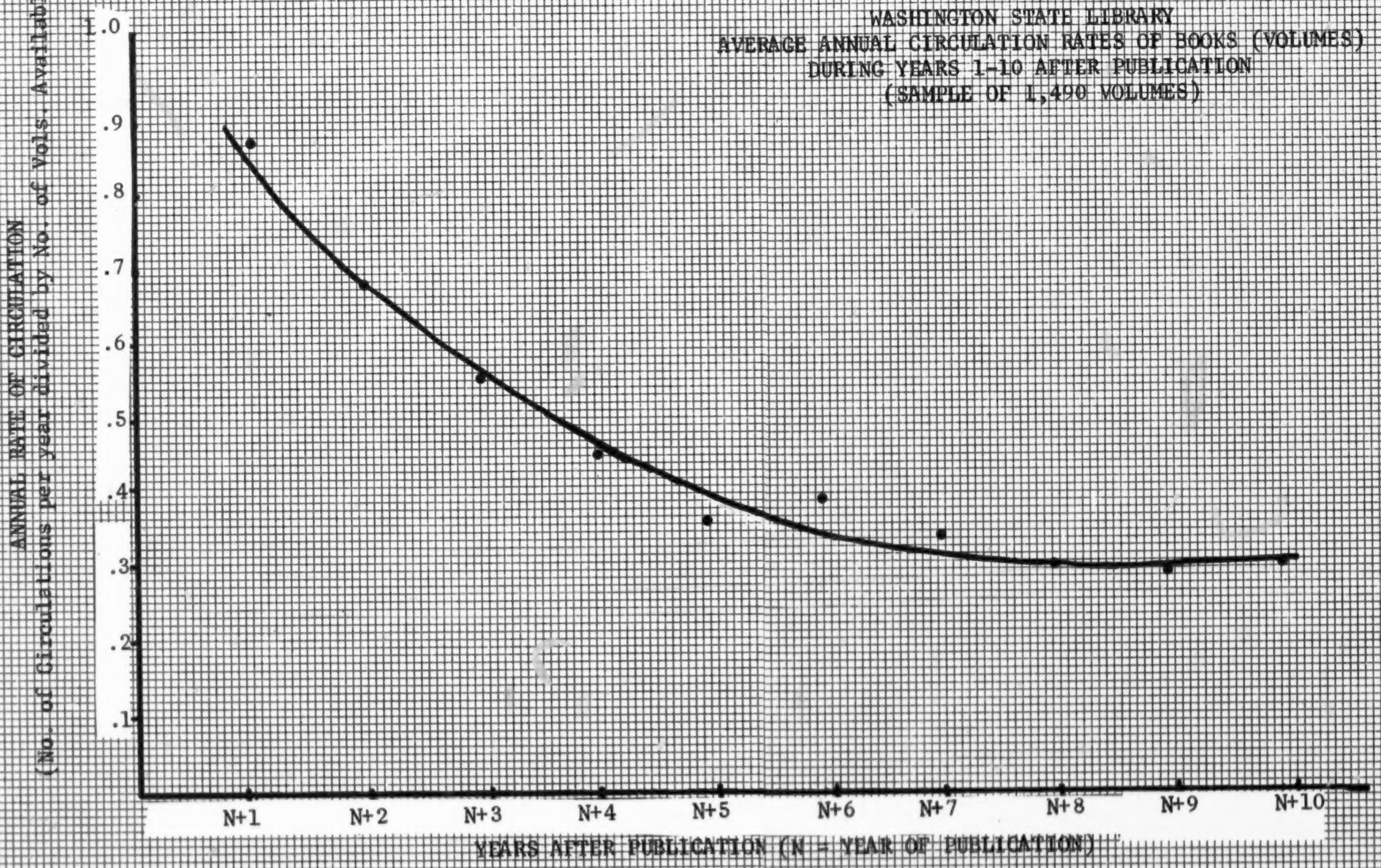


FIGURE B.6
WASHINGTON STATE LIBRARY
AVERAGE ANNUAL CIRCULATION RATES OF BOOKS (VOLUMES)
DURING YEARS 1-10 AFTER PUBLICATION
(SAMPLE OF 1,490 VOLUMES)

FIGURE B.7
CENTRAL WASHINGTON STATE COLLEGE
PERCENT OF COLLECTION (TITLES) CIRCULATED IN PERIOD 1/2/68-6/30/69

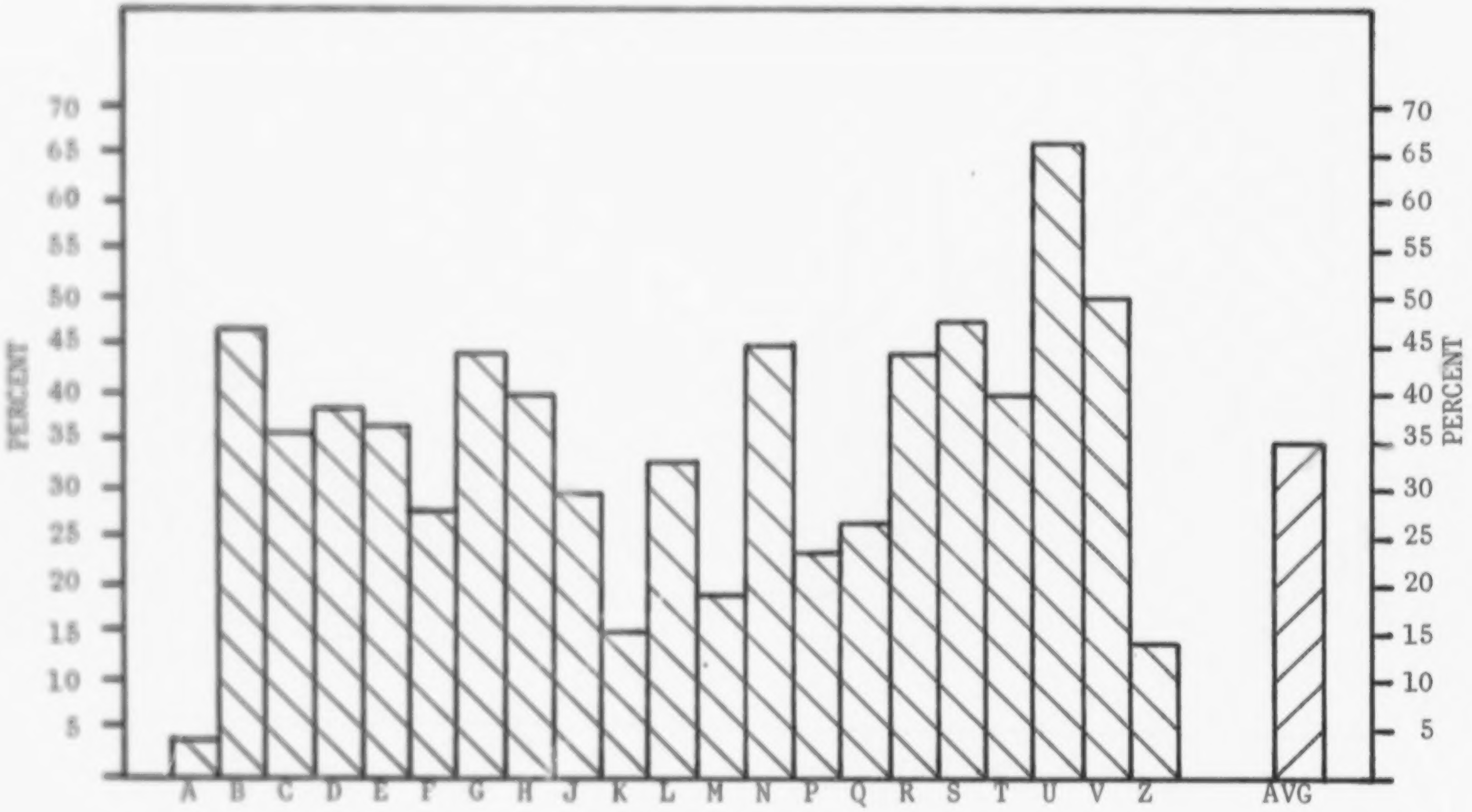
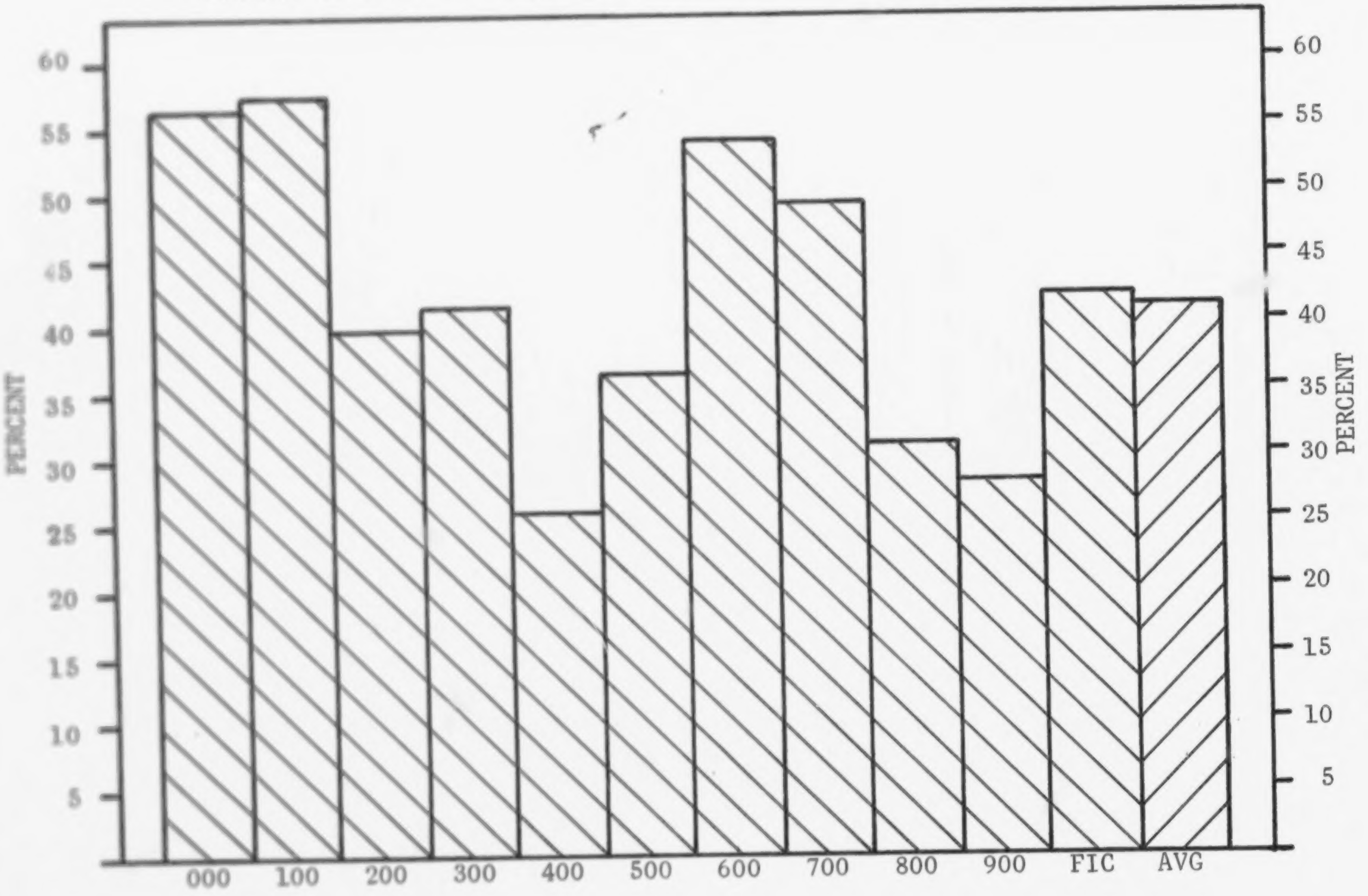


FIGURE B.8
BELLINGHAM PUBLIC LIBRARY
PERCENT OF COLLECTION (TITLES) CIRCULATED IN PERIOD 1/2/70-3/31/70



APPENDIX C
TECHNICAL SERVICES QUESTIONNAIRE

In order to establish a basis for comparison of alternate methods of providing technical services through networking, a survey was made of current costs of fulfilling the three technical services functions; acquisitions, cataloging, and processing (preparation). This was done by collecting pertinent data with a questionnaire sent to a sample of libraries. While satisfactory for the purposes of providing general estimates of technical services costs within alternate network configurations, data from the questionnaire is by no means sufficient to fix precise costs or to allow comparisons between libraries. Only a comprehensive technical services systems analysis--well beyond the constraints of this study--could provide definitive cost data.

C.1 Library Sample and Questionnaire

A sample of libraries was chosen to be representative of the size and type (public, academic, etc.) mix of publicly supported libraries in the state. Thirty institutions, or approximately 30% of the universe, were chosen. They consisted of twenty public libraries, five four-year colleges and universities and five community colleges. The return rates were, 11 or 55% of the public libraries, 4 or 80% of the four-year colleges and universities, and 5 or 100% of the community colleges, giving a total of 20 returns or 67%. Even in the case of public libraries with the lowest return rate, the size mix remained valid.

The questionnaire, a copy of which is presented in Exhibit C.1, consisted of four pages of questions plus a cover letter. Two kinds of information were gathered. One was data to be used in developing unit costs, number of volumes or titles handled, personnel utilized in each function and their salaries and supply and materials costs. The other was information on procedural matters; for example, tools used in cataloging, changes made in purchased cataloging data, items of equipment used, etc.

C.2 Results

Tables C.1 and C.2 present some results of analysis of the data collected. The two tables are identical except that one deals with academic libraries and the other with public libraries. Most of the columns are self explanatory but a few notes may be helpful. In all cases titles and volumes acquired in 1969, refer to the calendar year. Salary costs include a fixed percentage (11.5%) for fringe benefits for all institutions. No other overhead is included.

"% Annual Titles Backlogged" is the number of titles stated by the library as being in their "backlog" for the time periods divided by the number of titles cataloged in 1969. "L.C. Proof Slips" and "PW/BPR" indicate whether a library uses those tools as major sources of catalog data. "% Original Cataloging" means the cataloging of those items for which no cataloging data is available through the common sources, e.g. proof slips, L.C. cards, PW/BPR, Wilson cards, etc. "Titles F.T.E.", is the number of titles cataloged divided by the "Total Personnel (F.T.E.)". It can be used as an approximate measure of technical services output when comparing costs per title or per volume and has potential as a proxy for cataloging cost per title. Preliminary work indicates that correlation analysis produces a useful statement of cataloging costs for academic libraries as a function of titles per full time equivalent.

SUMMARY---TECHNICAL SERVICES SURVEY---ACADEMIC LIBRARIES

LIBRARY	TITLES	VOLUMES	ACQUISITION COSTS $	PERS. F.T.E.	CATALOGING COSTS $	PERS. F.T.E.	PROCESSING COSTS $	PERS. F.T.E.	TOTAL COSTS $	TOTAL PERS. F.T.E.	SALARY COSTS $	ACQUISITION COSTS/ TITLE $	CATALOGING COSTS/ TITLE $	PROCESSING COSTS/ VOL $
COMMUNITY COLLEGES:														
1	1,450	1,500	2,716	.50	8,225	1.0	3,730	1.0	14,671	2.50	14,248	1.873	5.672	2.487
2	3,000	4,000	1,391	.138	14,282	.95	7,104	1.25	22,777	2.338	21,847	0.464	4.761	1.766
3	3,281	3,281	4,890	.875	6,472	.275	3,264	.725	14,626	1.875	13,676	1.490	1.973	0.995
4	4,801	5,854	19,158	3.125	27,201	3.63	8,255	1.5	54,614	8.255	53,159	3.990	5.666	1.410
5	5,045	6,545	11,531	1.5	6,054*	.10	5,231	.875	22,816	2.475	15,966**	2.286	1.200	0.799
AVERAGE	3,515	4,236	7,937	1.23	12,446	1.19	5,516	1.07	25,901	3.47	25,732	2.258	3.541	1.302
MEDIAN	3,281	4,000	4,890	.875	8,225	.95	5,231	1.0	22,777	2.475	18,048	1.873	4.761	1.410
FOUR-YEAR COLLEGES & UNIVERSITIES:														
1	13,000	13,982	25,064	5.5	50,518	8.0	7,079	1.38	82,664	14.9	78,832	1.928	3.886	0.506
2	16,000	16,393	38,284	8.0	47,130	4.0	15,936	3.38	101,350	15.38	96,686	2.393	2.946	0.972
3	19,541	23,278	26,043	5.0	67,328	8.0	36,569	7.0	129,940	20.0	124,049	1.333	3.445	1.571
4	38,375	84,591	101,486	18.02	114,048	13.52	30,555	6.0	246,089	37.5	232,188	2.645	2.972	0.361
AVERAGE	21,729	34,561	47,719	9.13	69,756	8.38	22,534	4.44	140,010	21.95	132,939	2.196	3.210	0.652
MEDIAN	17,771	19,836	32,164	6.75	58,923	8.0	23,246	4.69	115,645	17.69	110,368	2.161	3.429	0.739

TABLE C.1

* This dollar figure is made of $1.20 times the number of titles acquired since according to the questionnaire, this institution buys all titles pre-cataloged at the above per title cost.

** This dollar figure does not include salary figures for cataloging because of the above.

SUMMARY---TECHNICAL SERVICES SURVEY---ACADEMIC LIBRARIES, Continued:

LIBRARY	TITLES	VOLUMES	% ANNUAL TITLES BACK-LOGGED 3-6 MOS.	% ANNUAL TITLES BACK-LOGGED >6 MOS.	% ORIG-INAL CATA-LOGING	L.C. PROOF SLIPS ?	PW/ BPR ?	% OF TI-TLES WITH PURCHASED CARDS	% OF TI-TLES WITH KITS	TITLES F.T.E.	LIBRARY
COMMUNITY COLLEGES:											
1	1,450	1,500	0.0	0.0	5.0	NO	YES	20.0	0.0	580	1
2	3,000	4,000	16.7	3.3	2.0	NO	YES	100.0	0.0	1,283	2
3	3,281	3,281	7.6	7.6	0.8	NO	YES	92.0	6.1	1,750	3
4	4,801	5,854	20.8	16.7	10.0	YES	NO	31.2	0.0	581	4
5	5,045	6,545	2.4	1.5	3.0	NO	YES	34.0	64.0	2,038	5
AVERAGE	3,515	4,236	9.5	5.8	4.2			55.4	14.02	1,012	
MEDIAN	3,281	4,000	7.6	3.3	3.0			34.0	3.05	1,283	
FOUR-YEAR COLLEGES & UNIVERSITIES:											
1	13,000	13,982	1.5	1.0	15.0	YES	NO	0.0	0.0	872	1
2	16,000	16,393	20.8	3.5	9.0	NO	NO	96.0	0.0	1,040	2
3	19,541	23,278	14.3	2.7	17.6	NO	YES	48.6	0.0	977	3
4	38,375	84,591	7.8	13.0	n/r	NO	NO	21.8	0.0	1,023	4
AVERAGE	21,729	34,561	11.10	5.05	13.87			41.6	0.0	989	
MEDIAN	17,771	19,836	11.05	3.10	15.0			35.2		1,000	

TABLE C.1., cont.

SUMMARY---TECHNICAL SERVICES SURVEY---PUBLIC LIBRARIES

PUBLIC LIBRARY	TITLES	VOLUMES	ACQUI-SITION COSTS $	PERS. F.T.E.	CATA-LOGING COSTS $	PERS. F.T.E.	PROCESS-ING COSTS $	PERS. F.T.E.	TOTAL COSTS $	TOTAL PERS. F.T.E.	SALARY COSTS $	ACQUISI-TION COSTS/ TITLE $	CATA-LOGING COSTS/ TITLE $	PROCESS-ING COSTS/ VOL $
1	179	198	313	.05	1,223	.2	428	.1	1,964	0.35	1,916	1.746	6.832	2.162
2	394	394	148	.05	531	.2	388	.1	1,067	0.35	964	0.375	1.348	0.985
3	3,000	3,144	1,536	.38	3,510	.5	2,607	.68	7,653	1.56	6,864	0.512	1.170	0.829
4	3,676	6,769	4,800	1.	7,490	1.	3,233	.6	15,523	2.60	14,382	1.306	2.038	0.478
5	3,918	5,829	3,041	.4	4,013	.4	1,956	.25	9,010	1.05	7,756	0.776	1.024	0.336
6	4,207	13,491	2,174	.5	7,567	.85	10,051	2.6	19,792	3.95	18,142	0.512	1.799	0.745
7	5,100	5,400	2,022	.3	6,534	.75	3,019	.6	11,575	1.65	10,231	0.396	1.281	0.559
8	5,652	11,413	2,688	.5	7,809	1.2	6,966	1.65	17,463	3.35	15,647	0.476	1.382	0.610
9	6,009	21,134	19,526	2.7	16,984	2.	13,769	2.7	50,279	7.40	47,810	3.249	2.826	0.652
10	6,200	7,219	5,480	.4	15,971	2.	5,920	.9	27,371	3.30	25,698	0.884	2.576	0.820
11	11,305	77,100	48,147	7.	57,961	6.5	25,703	9.	131,811	22.50	124,924	4.259	5.127	0.333
AVERAGE	4,513	13,826	8,170	1.21	11,781	1.42	6,731	1.74	26,682	4.36	24,939	1.810	2.611	0.487
MEDIAN	4,207	6,769	2,688	.5	7,490	.85	3,233	.68	15,523	3.30	14,382	0.884	2.038	0.745

TABLE C.2

S U M M A R Y - - - T E C H N I C A L   S E R V I C E S   S U R V E Y - - - P U B L I C   L I B R A R I E S, Continued:

PUBLIC LIBRARY	TITLES	VOLUMES	% ANNUAL TITLES BACK-LOGGED 3-6 MOS.	% ANNUAL TITLES BACK-LOGGED >6 MOS.	% ORIG-INAL CATA-LOGING	L.C. PROOF SLIPS ?	PW/ BPR ?	% OF TI-TLES WITH PURCHASED CARDS	% OF TI-TLES WITH KITS	TITLES F.T.E.	PUBLIC LIBRARY
1	179	198	14.0	0	10.0	NO	YES	72.0	72.0	511	1
2	394	394	0	0	50.0	NO	NO	0	0	1,125	2
3	3,000	3,144	0	0	8.0	NO	YES	24.2	0	1,923	3
4	3,676	6,769	n/r	n/r	30.0	NO	YES	0	0	1,414	4
5	3,918	5,829	1.	8.2	5.0	NO	YES	78.0	35.2	3,731	5
6	4,207	13,491	1.5	0	50.0	NO	NO	12.4	0	1,065	6
7	5,100	5,400	6.9	0	65.0	NO	NO	0	0	3,090	7
8	5,652	11,413	5.2	0	80.0	NO	YES	7.2	0	1,687	8
9	6,009	21,134	5.8	5.8	10.0	YES	YES	0	0	812	9
10	6,200	7,219	0.7	0.2	5.0	NO	YES	0	"some"	1,879	10
11	11,305	77,100	3.5	4.4	25.0	NO	YES	N/A	0	502	11
AVERAGE	4,513	13,826	3.86	1.86	30.73			19.39	10.72	1,613	
MEDIAN	4,207	6,769	3.5	0.1	25.0			7.2	--	1,414	

TABLE C.2. cont.

LOUIS BRUNO
Chairman, State Library Commission
ROBERT W. WOODS
Vice-Chairman, State Library Commission

MARYAN E. REYNOLDS
State Librarian

WASHINGTON STATE LIBRARY
Olympia
98501

March 19, 1970

EXHIBIT C.1

Dear Librarian:

As you are probably aware, the Washington State Library is presently conducting a research study to determine the development of the Washington State Library Network. This network is envisaged as encompassing many library functions such as Interlibrary Loan, Reference Service and some technical services. A major goal of the network is to provide improved service to libraries, and therefore the public, in the most economical fashion. In order to determine which is the most economical fashion, we need to know what the present costs of performing certain functions are. The attached questionnaire is designed to help us find out what these costs are for some technical services operations.

Your library has been chosen as one of a sample of libraries from which we need to collect information. The data you provide us will be used to project costs for these operations for all libraries in the state; therefore, it is very important that the information you give us is as complete as possible. The answers you provide will be used as a basis for comparison of possible alternative methods of providing centralized technical services so that a determination of which alternative will offer the most services for the least money can be made.

If your library has done any cost accounting studies of the functions covered on the questionnaire, we would appreciate your forwarding copies of the studies. We will be happy to reimburse you for any copying charges involved in getting this material to us.

The information you give will, of course, be kept strictly confidential, and your library will not be identified by name in any future publications or reports.

We have tried to make the questionnaire as straightforward as possible. If you have any questions regarding it, however, please do not hesitate to call either William Scholz or David Taylor at the State Library, (206)-753-5592, either on SCAN or collect.

In order to help us meet our deadlines, we would like to have the completed questionnaire returned to us by April 6, 1970.

Sincerely,

William Scholz
Planning and Research

WS:mr

PLEASE RETURN BY APRIL 6, 1970

EXHIBIT C.1, cont.

WASHINGTON STATE LIBRARY
TECHNICAL SERVICES

COST ACCOUNTING QUESTIONNAIRE

I. ACQUISITIONS

Definition: This function includes the placing of book orders with vendors or publishers, receiving the books ordered and paying invoices. This does not include book selection.

A. Please give a brief description of your book acquisitions operation; for example, "Librarian decides to purchase a book, purchase request is sent to acquisitions department. Acquisitions department types multiple order form, searches catalog and on-order file to determine if library has book or has it on order. Copy of order form is sent to vendor and other copies are sent to various files (card catalog, etc.) When book is received it is property stamped and on-order file is cleared, book is sent to cataloging department. Invoice is matched with book and approval for payment is made. Invoice is sent to business office for payment."

B. How many book orders did you place between January and December 1969?

__________ BOOK ORDERS

C. How many people are employed in the acquisitions function?

__________ PEOPLE

For each person, please give the number of hours worked per week in acquisitions as defined above and their salary as of December 1969.

Title	No. of Hours Per Week	Salary (Per Hour)

(Use additional sheets if necessary)

II. CATALOGING

Definition: This function includes the descriptive cataloging of books added to the library, subject classification and subject heading assignment. It includes cataloging done with bibliographic data of all kinds, e.g., L.C. proof slips, Publishers Weekly, National Union Catalog, etc., as well as original cataloging.

A. How many titles and how many volumes were cataloged in your library in 1969?

_________ TITLES _________ VOLUMES

B. How many people are employed in the cataloging function?

_________ PEOPLE

For each person, please give the number of hours worked per week in cataloging as defined above and their salary as of December 1969.

Title	No. of Hours Per Week	Salary (Per Hour)

C. Estimate the percentage of books requiring original cataloging cataloged in your library in 1969. ("Original" means no source of bibliographic data is available except the book itself.)

_________%

D. Estimate the number of titles waiting to be cataloged at this time. How many of these have been on your shelves "uncataloged" for:

3 to 6 months _________

6 months or more _________

E. Which of the tools listed below does your library use as sources of bibliographic data in cataloging?

1. L.C. Proof-slips _____
2. Publishers' Weekly/Book Publishing Record _____
3. Cumulative Book Index _____
4. L.C. Catalogs (including Natl. Union Catalog) _____
5. Other (specify) _____

(Use additional sheets if necessary)

F. How many titles did you buy sets of catalog cards for in 1969? (Include all types of cards, e.g., L.C., LJ, Wilson, etc.)

__________ TITLES

What was the average per set cost of those cards?

$__________

G. What percentage of these sets do you change in some way?

__________%

Please indicate those things you regularly change:

Entry ______
Call # ______
Descriptive Cataloging ______
Tracings ______
Other (Specify) ______

III. PROCESSING OF MATERIALS

Definition: This function includes the physical preparation of books necessary to place them on the shelf ready for circulation, e.g., book cards, pockets, spine labels, card reproduction, etc. It also includes book repair and the distribution of books to branches.

A. Please indicate the types of processing done in your library and the approximate percentage of volumes receiving each kind:

1. Book cards
2. Spine labeling
3. Pockets
4. Book covers (plastic jackets, laminated)
5. Other (Specify)

B. How many people are employed in the processing function?

__________ PEOPLE

For each person, please give the number of hours worked per week in processing as defined above and their salary as of December 1969.

Title	No. of Hours Per Week	Salary (Per Hour)

(Use additional sheets if necessary)

C. How many volumes were processed by this function from January through December 1969?

__________ VOLUMES

D. Do you buy volumes pre-processed? Yes_____; No_____

Or with kits? Yes_____; No_____

If Yes, what is the charge for this service from each of your vendors, and how many volumes did you buy from each vendor?

PRE-PROCESSED			KITS		
Vendor	Volumes	Charge	Vendor	Volumes	Charge

E. What items of equipment do you use for book processing?

1. Electric Stylus _____
2. Laminator _____
3. Label-maker _____
4. Pocket gluer _____
5. Other (Specify) _____

F. How do you reproduce catalog cards?

1. Hand typed _____
2. Xerox machine _____
3. Multilith _____
4. Other (Specify) _____

APPENDIX D
AUTOMATION OF TECHNICAL SERVICES

This appendix complements, from a technical point of view, the detailed study of costs and flows of the main report. This role is more modest than that envisaged by the original proposal and stems from the fact that technical design must follow, not precede, a detailed study of system costs and flows. This point of view is strongly endorsed by the California State Legislature in advising the California State Library to obtain cost studies before considering further the detailed technical studies of the Institute for Library Research at Berkeley (see comments in paragraph D.1.b). Being more general, however, this appendix should be readable by librarians other than technical specialists, thus increasing the circle of those able to discuss the major design issues and hopefully leading to better decisions in the long run. The purely quantitative aspects of this appendix are contained in Sections D.2.3, D.3.6, and D.5.

Washington State Library worked with the MARC I pilot project of the Library of Congress, was involved in the planning of MARC II, and is currently providing automated catalog services to Timberland and North Central Regional Libraries. The experience of the Technical Services Division in this work will be helpful in developing the systems proposed for the network. However, the fact that these are ongoing services of the State Library does serve as a constraint, since they cannot be arbitrarily curtailed in favor of more general network development.

D.1 Approaches to Library Automation

There are many different approaches to library automation, and this section will try to give an indication of their variety, using representative examples from the literature. The reason for this variety is in part that library automation is a complex activity and does require different approaches, and in part that people of widely differing backgrounds have become interested in the field.

a. Administration. De Gennaro[1] discusses the introduction of automated systems in an academic library from an administrative point of view. He speaks of three approaches: to wait for developments; to develop a total system in one go; and to adopt an evolutionary approach. Building the capability for automation is also discussed.

b. Cost/Benefit. Arthur Young and Company[2] define the scope of a cost/benefit study for the California State Library. The first few pages of this report are of great value in pointing out that from a legislative point of view, whether or not to proceed with a system for a public body depends not primarily upon the technical means but upon the gross costs and benefits projected for the system in comparison with current values of these costs and benefits.

c. Business Systems Analysis. As Chapman and St. Pierre[3] point out, systems analysis does not necessarily imply automation, (although automation will almost always benefit from systems analysis). They describe five major steps: analysis and understanding of current procedures; determination of the requirements of the system; determination of the inputs; evaluation of current procedures to see if they satisfy requirements; and design of a new system or modification of the old. The kind of system being analyzed is typically one based on extensive paperwork and with a number of different work stations such as found in banks, insurance companies, or libraries.

d. Technical Design. The Institute of Library Research at Berkeley has carried out detailed technical studies for a proposed California State Library Processing Center.[4] These reports consider a wide variety of technical issues in great detail, including: production and control, conversion, file maintenance, authority verification, book catalog filing, book catalog format, processing center organization, coding manual, and serials control. Much of this is in sufficient detail to provide excellent reference for the Washington State network when the planning for the latter reaches a comparable level of detail.

e. Subroutines. Alanen[5] discusses certain unique requirements of bibliographic data processing and suggests that the best way to meet these is by the construction of a set of subroutines for this purpose. These would include subsets for input/output, for identification and location of data, and for processing. Thus, original programming would be simplified.

f. Existing Programming Languages. Burgess[6] discusses a number of existing high level languages (Fortran, Cobol, PL/1, Snobol) in terms of their suitability for programming information storage and retrieval systems. The requirements are very similar to those of library automation. Burgess lists a number of desirable language properties and assesses each language against these. He also points out that the hardware and operating system environment can considerably affect the use of a particular language, either favorably or unfavorably.

g. New Programming Languages. Dolby and Resnikoff[7] discuss the requirements on a new high level programming language designed specifically for bibliographic data processing. They point out the important fact that the operations performed by Fortran and Cobol were thoroughly understood and agreed upon long before the languages were devised. In the field of bibliographic data processing, however, there is little agreement, and considerable ignorance in fact, as to what the basic operations are. Language construction in such a case is understandably difficult.

As can be seen, the approaches mentioned above have been listed in increasing level of detail or technical specificity. The present study lies towards the top of the list, bridging (a)-(d) with perhaps most emphasis on (b). This is the main reason for this appendix having the general character that it does.

The current automation activities of the Washington State Library are fairly small-scale ones aimed at providing cataloging services and book catalogs to a small number of client regional libraries. Development has been evolutionary, dating from the initial involvement in the MARC I project of the Library of Congress. It is not clear yet whether this evolution can continue into the proposed network system or whether there will be a discrete break and something of a new beginning.

Three of the major nationally known systems of interest to the current study for the purposes of comparison and contrast are the Ohio College Library Center (OCLC), the bibliographic automation project at Stanford Libraries (BALLOTS), and the New England Library Information Network (NELINET). Their major emphasis as a group is in approach (d) above, technical design and implementation. The present study emphasizes quantitative modeling and cost/benefit considerations to a much greater extent. Consequently, when technical details are refined at a later date they will be based upon a prior comprehensive knowledge of flows and costs.

D.2 System Environment

This section considers some of the factors which exercise a determining influence upon the technical system and within which the design must take place. The discussion is divided into four parts: objectives; constraints; quantitative parameters; and hardware/software environment.

D.2.1 Objectives

The technical system being discussed in this appendix is a computer/communication system together with operating procedures, designed to support the overall objectives of the network. These objectives can be split into long and short range. The former tends to be vague, and so this section is mainly concerned with technical system objectives governing the next three years or less.

Discussion is limited to only one example of a limited class of technical systems and assumes that the State Library will design, implement and operate some form of centralized computer system. However, there are an almost endless variety of alternative systems which might be considered, for example:

a. Centralize cataloging, but perform it manually. Chapter 3 indicates that this alone would provide substantial savings.

b. Automate in the direction proposed below, but do so on a regional basis.

c. Buy cataloging data "wholesale" from national sources, public or private, and "retail" it to local libraries.

d. Contract all technical services out to specialist commercial organizations with the State Library only concerned with the specifications for these services, whether or not they are performed adequately, and their cost.

A consideration of alternatives such as these must be made when the data of the present report have been digested and in some cases followed up in more detail. However, for the moment, a reasonable middle-of-the-road system has been selected for discussion in this appendix, as an example of a general approach to system design.

As the main report has shown, the network is concerned with a variety of types of library (public, university, college, community college, and state) as well as a variety of functions (interlibrary loan, technical services, and collection management). A wide range of technical and organizational systems can be proposed to support network services at various levels of sophistication and cost. A conservative system is proposed below. Two general guidelines are: it is preferable to have to upgrade a conservative system rather than to cut back an advanced one; and secondly, those things should be attempted which are needed for future developments rather than those which are final products in themselves. The following objectives are therefore proposed:

a. Build a cumulative state-wide bibliographic and holdings data bank. Provide catalog products on demand (catalog cards, book cards, spine labels). The data bank should include data derived from MARC tapes as well as from original cataloging.

b. Produce current acquisition lists for member libraries on a regular basis.

c. Produce statistical reports on acquisitions data on a regular basis.

d. Construct a book catalog for the Washington State Library collection.

e. Continue any current commitments which cannot be met by above or dropped.

It should be noted that, apart from (d), there is no provision for retrospective cataloging. Decisions on this should await a consideration of the findings of the RECON project. Also, no provision is made for catalogs at the local or regional level. Book catalogs are quite expensive, and they come in an almost endless variety. Choices must be made as to what purpose they will serve, e.g., bibliographic reference or finding list, what frequency of production and cumulation, what information to include for each entry, what access points to provide, and what scope of contents, e.g., by individual library or by region. These choices should not be made arbitrarily, and so it seems better to delay book catalog production until some of these questions have been studied more carefully in relation to the objectives of the network as it serves the state of Washington.

On the positive side, (a) serves the technical services function of the network through centralized cataloging and catalog products as well as laying the groundwork for future machine-based catalog services. Items (b) and (c) serve the collection management function of the network, and item (d) the interlibrary loan function, since a large proportion of all such loans are made by the State Library. In addition, (d) gives practice in constructing a complete machine-based catalog for a collection and will permit the important printed catalog/microform catalog issue to be explored.

In relation to existing State Library computer activities, the starting of the network system proper is a watershed in respect of files, formats, documentation, standards, etc. It is the first step towards an integrated system, permanently machine-based. The question of whether or not existing programs and procedures are adequate for, or can be adapted to, this task must be considered. To have to redo substantial portions of the system, either programming or data conversion, in a few years would be most unfortunate.

D.2.2 Constraints

Some of the most obvious constraints are mentioned below.

a. Existing operational commitments. Washington State Library already provides book catalog services to two regional public libraries (Timberland and North Central). These cannot be discontinued arbitrarily, and so the question of how they fit into the proposed system development must be considered.

b. Costs. Chapter 3 of the main report has indicated some of the savings that would accrue to individual libraries, if all cataloging were to be centralized. These savings are shown in Table D.1 by type of library and amount to a state-wide total of almost $700,000 annually. However, these figures are deceptive since there is virtually no way in which these savings can be collected and made available to the processing center. Charging for some services would help, but in the initial stages this may discourage use unduly. It seems more likely, therefore, that the processing center will be an additional budget item for the State Library, whether supported by state or federal funds. Estimates of what the proposed system might cost are given in Section D.5. To give a sense of perspective, technical services costs average about 10% of total library operations budgets.

c. Personnel. The Technical Services Division at the State Library does not have an adequate technically qualified staff for the proposed system, although additions are currently being made. At the moment the division's technical strength consists of the chief, Mrs. Josephine Pulsifer, who also has a great deal of outside responsibility, a computer systems analyst, and contract programmer and analyst time from the state Data Processing Service Center. In fact, it is remarkable that the division has done as well as it has up till now with such limited resources. For the future, however, the division must have adequate support, with the addition of a number of technically qualified people to the staff, one of whom should be at the level of deputy chief for machine-based systems. None of these need be librarians.

d. Facilities. The Technical Services Division occupies space in the State Library building. While adequate for current activities, more space will probably be required as the proposed system develops.

Computer facilities are provided by the State Data Processing Service Center. This represents a possible constraint but one which should not be too severe (see Section D.2.4). The fairly modest system proposed at first should run adequately at the Data Processing Service Center. Legally, the State Library may, with due cause, obtain either outside commercial computer services or even its own computer. However, it does not seem that either course will be necessary in the immediate future.

D.2.3 Quantitative Parameters

It is both possible and desirable to estimate and project some of the loads on the proposed system, for example, file size and access/processing frequency for various functions. Costs will be dealt with in Section D.5. Basic data is shown in Table D.2 and computed data in Table D.3. Figures have been rounded slightly in some cases, and the data is for 1969 and all types of library taken together (public, university, college, community college and state), except where stated. Table D.4 shows a breakdown of volume and titles by type of library so that there is some feeling of how the calculations of Section D.5 could be repeated for individual types of library, although the state-wide unique title figures would need to be revised.

TABLE D.1
STATE-WIDE COST OF TECHNICAL SERVICES
(Data from Chapter 3)

TYPE OF LIBRARY	COSTS CURRENT	 CENTRALIZED	 SAVINGS
Public	$1,024,586	$ 689,102	$355,484
University	315,743	205,858	109,885
College	213,389	129,899	83,490
Community College	332,603	204,212	128,391
State	57,496	35,428	22,068
TOTAL	$1,943,817	$1,264,499	$679,318

NOTE: These are costs for a state-wide system embracing all types of library. The costs of a state-wide system embracing only one type of library, e.g., public, are different from those shown above.

TABLE D.2
QUANTITATIVE PARAMETERS -- BASIC DATA

Total volumes acquired	750,000/yr	1969 data
Total locally unique titles acquired .	300,000/yr	study data
Total state-wide unique titles acquired	75,000/yr	study data
Total state-wide unique titles	1,100,000	study data
Total State Library titles	150,000	1969 data
MARC tapes	1,200 titles/wk	
% new titles found on MARC	60%	estimated
Mean time to acquire books	6 weeks . .	estimated
Time limit after which original cataloging is sought for title . . .	8 weeks . .	suggested
Bibliographic record; e.g., holdings, in process, MARC	500 characters/estimated	
Query record (request for catalog data and products)	50 characters/estimated	
Receipt card record	50 characters/estimated	

TABLE D.3
QUANTITATIVE PARAMETERS -- COMPUTED DATA

Union catalog (hypothetical)	5.5×10^{8} characters
Cumulative holdings file $75{,}000 \times 500 = 37.5 \times 10^{6}$	37.5×10^{6} characters/yr
Cumulative MARC file $1{,}200 \times 50 \times 500 = 30 \times 10^{6}$	30×10^{6} characters/yr
In process file (steady state) # records at one time x record length $(300{,}000 \times 6/50) \times 500 = 18 \times 10^{6}$	18×10^{6} characters
Query file (steady state) # records at one time x record length $(300{,}000 \times 8/50) \times 50 = 2.4 \times 10^{6}$	2.4×10^{6} characters
MARC titles 60% x 75,000	45,000/yr
Original cataloging 40% x 75,000	30,000/yr
State Library Catalog $150{,}000 \times 500 = 7.5 \times 10^{7}$	7.5×10^{7} characters

NOTE: A year of 50 weeks has been used for convenience.

TABLE D.4
TITLES AND VOLUMES BY TYPE OF LIBRARY
(Data is state-wide for 1969 from Chapter 3)

TYPE OF LIBRARY	VOLUMES	LOCALLY UNIQUE TITLES	CONTRIBUTIONS TO STATE-WIDE UNIQUE TITLES
Public	474,878	147,938	36,096
University	122,397	48,461	11,824
College	48,817	36,820	8,984
Community College	82,534	56,618	13,815
State	14,727	9,732	2,375
TOTAL	743,353	299,569	73,094

D.2.4 Hardware/software Environment

It is most likely that the proposed system will be implemented at the State Data Processing Service Center, as explained in paragraph D.2.2d. The Service Center exists to provide data processing services to those state agencies who may need them. It is not the only computer system in state government. Various departments, e.g., Department of Motor Vehicles and Department of Institutions, have their own systems.

At the moment the hardware of the Service Center consists of two systems, IBM System/360 Models 30 and 50.

The Model 30 system is primarily used for running older programs, e.g., written for the IBM 1401, through emulation, rather than new programs written expressly for the System/360.

The Model 50 system is the major system of the Service Center. It has 512K bytes of core memory in four partitions and runs under 360/OS MFT II. The peripherals include one card reader/punch, two line printers, eight 9-channel tape units, twenty-one modules of 2314 removable disc storage and numerous remote terminals, both video as well as typewriter or teletype. The use of remote processing has risen rapidly, due to recent requirements for continuous on-line access, e.g., by the State Patrol. A second Model 50 central processor is on order and the two will then be used to split the workload, one primarily for batch processing, and one primarily for on-line.

Major languages available are 360 Basic Assembly Language (BAL), Fortran, Cobol and PL/1. The use of the last named is not encouraged on the grounds that the compilers are not yet entirely reliable.

D.3 System Design

This section considers some features of system design in general terms. The system is expected to work in the following way. Individual libraries order and receive books as they do now. At the time of ordering, a copy of the order form is sent to the State Library, and this constitutes a request for catalog data and products (catalog cards, book cards, spine labels) for the book. These products are derived from machine-based bibliographic data files if available in a weekly batch processing cycle. If not, after an eight-week period, the book is cataloged originally and pertinent data entered into the machine files. When the book is received by the local library, notice is sent to the State Library for the holding file. The machine-based bibliographic files are derived from MARC tapes and original cataloging. This differs somewhat from what is proposed by the State Library, but the differences are slight. They are mainly that the State Library does not intend to use receipt cards and will only do brief original cataloging for titles expected later through MARC.

The discussion is divided into six parts: files; record formats; basic processing functions; data quality control; statistics; and notation.

D.3.1 Files

The machine-based information that is at the heart of the proposed system will be stored in various files. Questions to be asked include: what files are needed, how large will they be, what storage medium should be used, etc. This section considers some of these questions briefly.

The main files are MARC cumulative (30×10^6 characters/yr), holdings cumulative (37.5×10^6 characters/yr), in-process (18×10^6 characters steady state), and query (2.4×10^6 characters steady state). There may also be an authority file (of unknown size) for maintaining control of subject headings, a library file (small) with data on each member library, and a file containing records for statistical purposes.

A major question is how the first three files should be organized as a group. Essentially, once a week a new MARC tape will be added to the MARC file, the new queries added to the query file, and then the query file passed against some combination of the first three files. Depending on the probabilities (completely unknown) of finding the query catalog data on each of these three files, they should be searched in a specific order in order to minimize mean search time. Operating data should quickly lead to statistics to optimize this choice.

Another question is whether or not to remove from the cumulative MARC file those records also found on the holdings file. Using the 60% hit rate, this would amount to 22.5×10^6 characters/year to be removed from the MARC cumulative file, reducing it from 30×10^6 to 7.5×10^6 characters/year. Since this is at the cost of the integrity of the MARC file as a comprehensive cumulation of Library of Congress output, this issue may be decided either way.

How the files are organized internally is another question, that is, in sequential or random order, with or without associated index or directory files. Not all records will have an LC card number, so this cannot be used as a universal record identifier. The Institute of Library Research, in their study for the California State Library, advocates keeping the lengthy bibliographic records in one file, assigning sequential identification numbers as they are added in, and short index records (both author and title) sorted in another. As an approach, this is attractive. Decisions on this must await more detailed design.

How should these files be stored? The main choice is threefold; magnetic tape, off-line disc or on-line disc. Costs are compared in section D.5. Off-line disc is probably the best compromise, offering more flexible processing at low cost. The removable disc packs of the

IBM 2314 Disc Storage System are of particular advantage here. On-line disc storage is not needed until on-line remote processing is required.

D.3.2 Record Formats

The format of a record is the way in which the data of the record is organized. Up till the MARC I project in 1966, there was virtually no agreement on record formats for bibliographic data. This meant that machine-based information prepared at one installation could not be utilized at another. The Library of Congress now sends out weekly tapes in MARC II format (a revised successor to the pilot MARC I). This format is fast becoming a standard or at least the basis for one.

However, the MARC II format is a communications format. That is, it governs the format of data so that the data can be communicated between two installations. It is not a processing format or a storage format and has, nothing to do with how a local installation processes or stores the data. This means that formats for processing and storage need to be selected. They need only be compatible with MARC II, not MARC II itself.

The MARC II format defines a record as consisting of a continuous sequence of characters, organized into five groups. The first is a fixed length leader which contains information about the record, how long it is, what type, e.g., monograph, etc. The second is the directory to each of the fields following. The third is a control number field of variable length, in fact, containing the LC card number. The fourth is a group of fields of fixed length. The fifth and last is the group of fields of variable length, some with subfields.

The format is defined in structural terms, and the actual data need not be bibliographic. Since programs that process these records do so largely on the basis of their format or structure rather than their content, there is an advantage in having as much of the system data in a compatible format as possible. This means, for example, storing the query records in MARC II format, as well as the authority file and local library data in similar fashion. Then programs written to process MARC II bibliographic records will also process these other ones too.

But, as was said above, the MARC II format is a communications format and it is necessary to select additional formats for processing and storage. The suggestion is therefore made that as far as possible, the variety of formats should be restricted and that common formats be chosen for processing and storage for as many files as possible. These would be easily compatible with MARC II and might be called WAshington State Processing formats, or WASP formats for short! To do this will lead to economy in program and file design as well as restricting conceptual detail from needless intricacy.

D.3.3 Basic Processing Functions

A variety of basic processing functions are required to support the proposed system. If the suggestion of a common record format is followed, then one program will be able to perform the same operation on different files, with corresponding economy.

a. Single file operations. General purpose operations are required such as file creation, editing, updating, sorting, listing and searching. Updating includes the addition of records to the file or deletion of records from it. The programs which implement these functions will assume WASP record format.

b. Multi-file operations. General purpose operations are required such as merging two or more files, and matching two files for common records or records containing common values of a particular field. In the latter case, the original two files (say A and B) are split into three files, a file of common records, the residual A file, and the residual B file.

c. Special purpose operations. A number of special purpose operations are required:

   - -- format conversion from MARC II to WASP and vice versa.
   - -- preparation of MARC II or WASP format records -- original cataloging input.
   - -- production of catalog products from bibliographic data files.
   - -- special format for printed output, either line printer, photocomposition or microform.
   - -- statistical operations not available in packaged programs.

D.3.4 Data quality control

The proposed system will build large permanent machine-based data files. If there is no planned quality control of these files, the data in them will not be completely reliable. The significance of this varies. For data that is not used for access, such as the imprint, errors are a nuisance but not really serious. For data that is used for access, such as LC card number, errors are extremely serious. Records dependent upon erroneous data may be essentially lost to the system. There are four major ways in which data quality can degrade.

In the first case, erroneous data is entered into the system on input. This can be avoided, or at least minimized, by rigorous proofreading and verification before final data entry with edit and correction cycle continuing as long as necessary.

In the second case, data degrades through errors of primarily machine origin. These can occur at different levels and are dealt with at different levels. Single bit errors occurring between memory and secondary storage may be detected by hardware parity checks. Errors in single characters or groups of characters may be detected by check sum calculations performed on record transfer by system software. Similar errors may also be detected by applications software, i.e., user programs, through such schemes as check digits.

In the third case, malfunctioning of system software in a multiprogramming environment can lead to random quantities of disc-stored data being destroyed, sometimes undetectably. If this error is not suspected at the time it occurs, then virtually no recovery is possible.

In the fourth case, a hardware malfunction causes the destruction of data at a known time. This can be protected against by maintaining a set of back-up tapes of the data, say one day old, one week old, one month old, and so on. Of course, the longer ago the error occurred, the greater the effort to correct it.

Errors cannot be prevented, but they and their effects can be minimized.

D.3.5 Statistics

No large enterprise today can afford not to gather management information from its operating data. One of the major tasks of the present study has been to piece together data on various aspects of library operations in Washington state and show how management conclusions can be drawn. Most of this data has been obtained from ad hoc sampling and surveys. What is needed is a system of ongoing data collection, together with procedures for deriving useful management information from such data. If part of the proposed processing system is to be machine based, then the computer should also be responsible for generating useful statistics regarding the data passing through it. Since much network activity, e.g., interlibrary loan and circulation, will take place outside of the machine (at least at first), data on these operations must be sought separately.

The data under computer control in the initial system are the current acquisitions of the member libraries. Much useful management information can be obtained from these. Data on the overlap between the acquisitions of different libraries can be obtained broken down by subject matter and year of material and by size and type of library. Distribution of material by subject matter, by year, and size and type of library can be obtained. This information can be consolidated into regional figures if required. The load upon the processing center by time of year can be learned together with information upon which machine-based files are most likely to supply requested catalog data. The cost of obtaining this information in useful form should be slight since the records upon which it is based all exist in machine readable form. What is required is that provision for this should be designed into the machine system from the onset.

D.3.6 Notation

The design of any large system requires a precise descriptive notation. Such a notation serves as a communication bridge between the various people concerned with the design. The designer must communicate in two directions, with the technical specialist who will build the system and with the lay colleague who is concerned that the technical system furthers the objectives of the overall system of which it is a part. In the present case, flow charts are an excellent notation when the designer is talking to programmers, but not so good when he is talking to librarians. For this, a more general notation is useful, such as the block diagram. An example is given in Figure D.1.

Data at the processing center are stored in various files or sets:

M	MARC (cumulative)
H	Holdings (cumulative)
Q	Query (steady state)
P	In-process (steady state)

The main products are:

CP	Catalog products
R	Receipt cards for libraries to return upon receipt of books from vendors

Increments to these files are indicated by the symbol Δ, e.g., ΔM is the weekly MARC incremental tape. δQ is that part of the query file sent to original cataloging after 8 weeks' waiting. Files which are modified by the processing are shown as F'. The logical relationships AND, OR and NOT are shown by $\frown$ $\smile$ and $-$ respectively. The symbols + and - are used in the sense of adding and subtracting elements from sets. The operations of summation (or merging) and matching sets are indicated by Σ and X respectively. Original cataloging is shown by OC, and sorting by S.

Using these symbols, a particular version of the flow of data through the processing center can be shown in Figure D.1. In addition, the diagram shown in Figure D.1 can be represented entirely symbolically as follows:

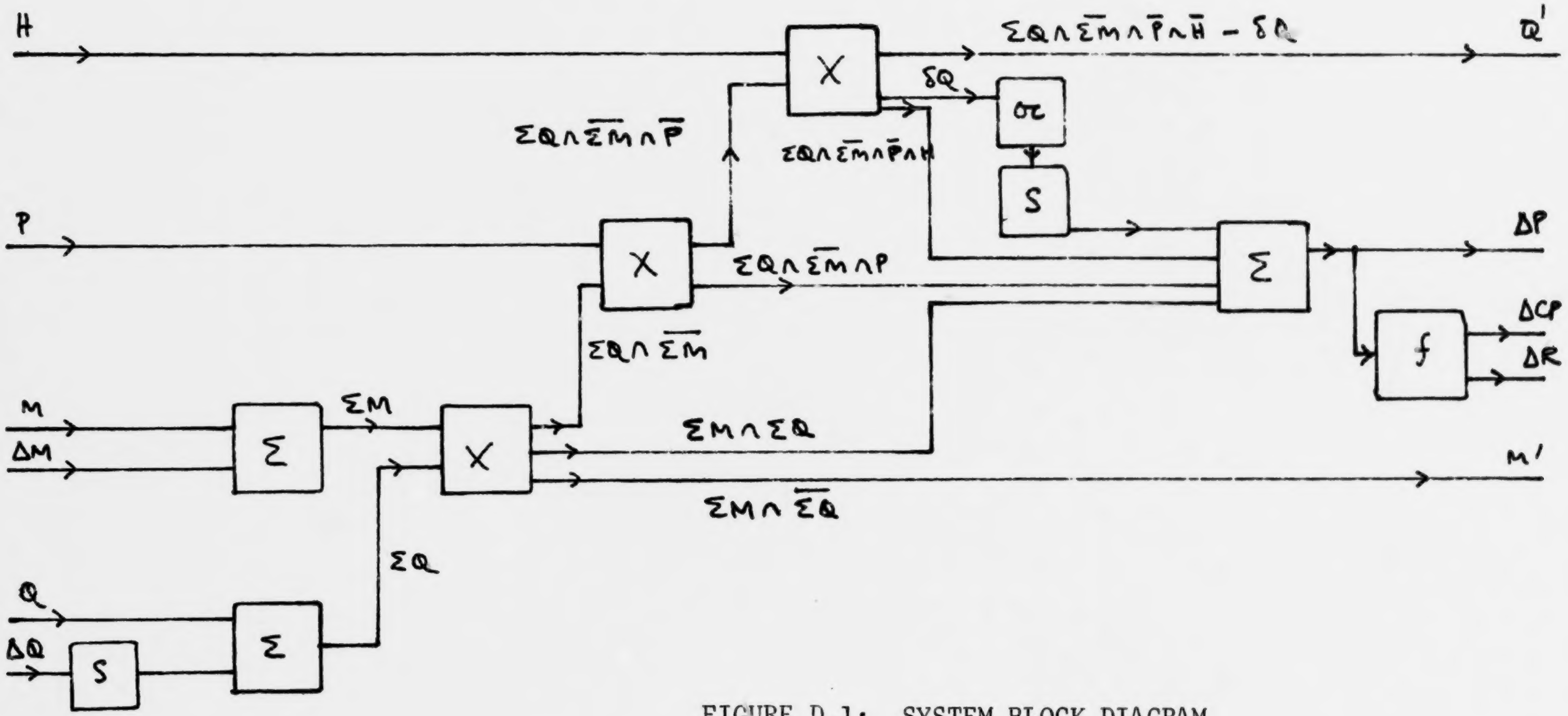

H
P
M
ΔM
Q
ΔQ
S
Σ
Σ
ΣM
ΣQ
X
X
X
$\Sigma Q \wedge \overline{\Sigma M}$
$\Sigma Q \wedge \overline{\Sigma M} \wedge \overline{P}$
$\Sigma Q \wedge \overline{\Sigma M} \wedge P$
$\Sigma Q \wedge \overline{\Sigma M} \wedge \overline{P} \wedge H$
$\Sigma Q \wedge \overline{\Sigma M} \wedge \overline{P} \wedge \overline{H} - \delta Q$
δQ
σ
S
$\Sigma M \wedge \Sigma Q$
$\Sigma M \wedge \overline{\Sigma Q}$
Σ
f
Q'
ΔP
ΔCP
ΔR
M'

FIGURE D.1: SYSTEM BLOCK DIAGRAM

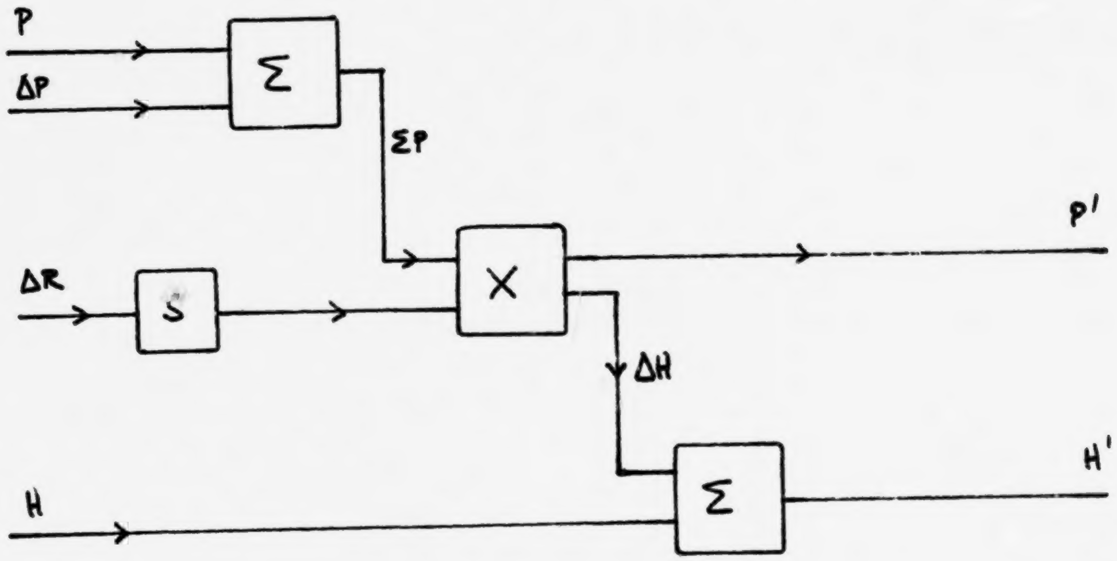

P
ΔP
Σ
ΣP
ΔR
S
×
P'
ΔH
H
Σ
H'

FIGURE D.1: SYSTEM BLOCK DIAGRAM (continued)

$$\Sigma M = M + \Delta M$$

$$\Sigma Q = Q + \Delta Q$$

$$M' = \Sigma M \cap \overline{\Sigma Q}$$

$$Q' = \Sigma Q \cap \overline{\Sigma M} \cap \overline{P} \cap \overline{H} - \delta Q$$

$$\Delta P = \Sigma Q \cap \Sigma M + \Sigma Q \cap \overline{\Sigma M} \cap P$$

$$\Delta CP = f\{\Delta P\}$$

$$\Delta R = f\{\Delta P\}$$

$$\Delta H = \Sigma P \cap \Sigma R$$

$$P' = \Sigma P - \Delta H$$

$$H' = H + \Delta H$$

Although not absolutely accurate, this example of notation shows how a system can be represented by either graphic or symbolic means. At this level of detail, alternatives can be discussed with the wider library community and final design decisions made. From such a notation the transition to flow charts for programmers is much easier than if narrative text only has been used to describe the proposed design. In addition, a block diagram such as Figure D.1 can be the basis for cost estimates as carried out in section D.5.

D.4 System Implementation

This section discusses some aspects of system implementation under the headings: Programming; Documentation; and Schedule.

D.4.1 Programming

Eventually the proposed system is to be implemented on an existing computer system in an available programming language. In the present case there is not much freedom of choice in the matter of computer system which will probably be at the state Data Processing Service Center. However, there is a choice when it comes to programming language.

The choice is between the Basic Assembly language (BAL) for the System/360, and a high level language such as Fortran, Cobol or PL/1. Although both Fortran and Cobol could be used, they are not as suitable as PL/1 to the task of processing variable length tagged records which is what the data is largely like. For this reason, it is simpler to debate the issues between BAL and PL/1.

Greater efficiency at run time is the main advantage of BAL, and clearly will be decisive if run time costs are large and dominate the overall costs. Assembly time for BAL programs is less than compile time for PL/1, but this is unlikely to be a decisive matter.

PL/1 has the advantage of producing shorter and more clearly understandable source programs in a shorter time than BAL. Thus program development and subsequent modification are much easier. Since the system will eventually come to comprise some very large programs, the increased conceptual grasp of the system provided by PL/1 source programs is an advantage.

When consideration is given to moving the entire system to future computers, PL/1 has the slight edge. While BAL will probably be emulated on future IBM machines, PL/1 is more likely to become available on other manufacturers' equipment.

The basic issue is still run time speed for BAL versus development speed and easier conceptual understanding for PL/1. The State Library is approaching a processing system of the scope proposed for the first time and so it is likely that there will be need to modify the programs in the light of experience. The flexibility to modify programs that such a situation makes desirable would seem to make PL/1 the first choice.

These remarks are simply a rehearsal of the well-known trade-off in using either an assembly or a high level language. Their applicability to the case in hand must be considered in the light of any special requirements of the programs themselves. In addition, there is a reluctance to use PL/1 at the Service Center.

Beyond the choice of programming language, the question of growth and eventually transferability must be kept in mind. The system will grow most easily if it is constructed on modular lines such that successive modules can be introduced or upgraded independently of the rest of the system. Transferability is also enhanced by such an approach.

D.4.2 Documentation

It is not enough just to construct the proposed system, it must be thoroughly documented. This is absolutely essential and not a luxury, whether for an in-house system, or one bought from outside. Documentation is important since it protects the system from the effects of changing personnel, it facilitates communication about the system between various personnel working on it, and it makes subsequent modification enormously easier. Delivering or accepting a programming system without documentation is like delivering or accepting a major new building without any architectural plans.

Documentation can be addressed to different levels, from managerial to programmer. It can be at various levels of detail, from general narrative, through basic design concepts, to the code of individual subroutines. It is not a trivial task to produce good documentation for a system, and some projects employ personnel for documentation in addition to those for actual programming.

At a minimum, documentation can include some or all of the features below:

General narrative description

Design characteristics

Flow charts

Program listings

Operating instructions

Input requirements and examples

Output capability and examples

Core and storage requirements

Cost and timing data

D.4.3 Schedule

It is desirable, though not easy, to plan accurate schedules for the implementation of systems such as the one proposed. A schedule for the construction of the basic catalog data system within one calendar year is shown in Figure D.2. The State Library catalog would then begin. It is easy to be overly optimistic and the suggested schedule may need to be extended by up to fifty percent before being finalized.

D.5 System Costs

The aim of this appendix is to estimate the operating costs of the proposed computer system as represented by Figure D.1. Weekly batch processing cycles are assumed. (Development costs are something else again and are likely to occur at a high rate for a limited period of time.)

The method followed is:

a. To break down the system of Figure D.1 into such functions as cataloging, storage, processing and printing, and to estimate volumes;

b. To estimate basic unit costs for these functions;

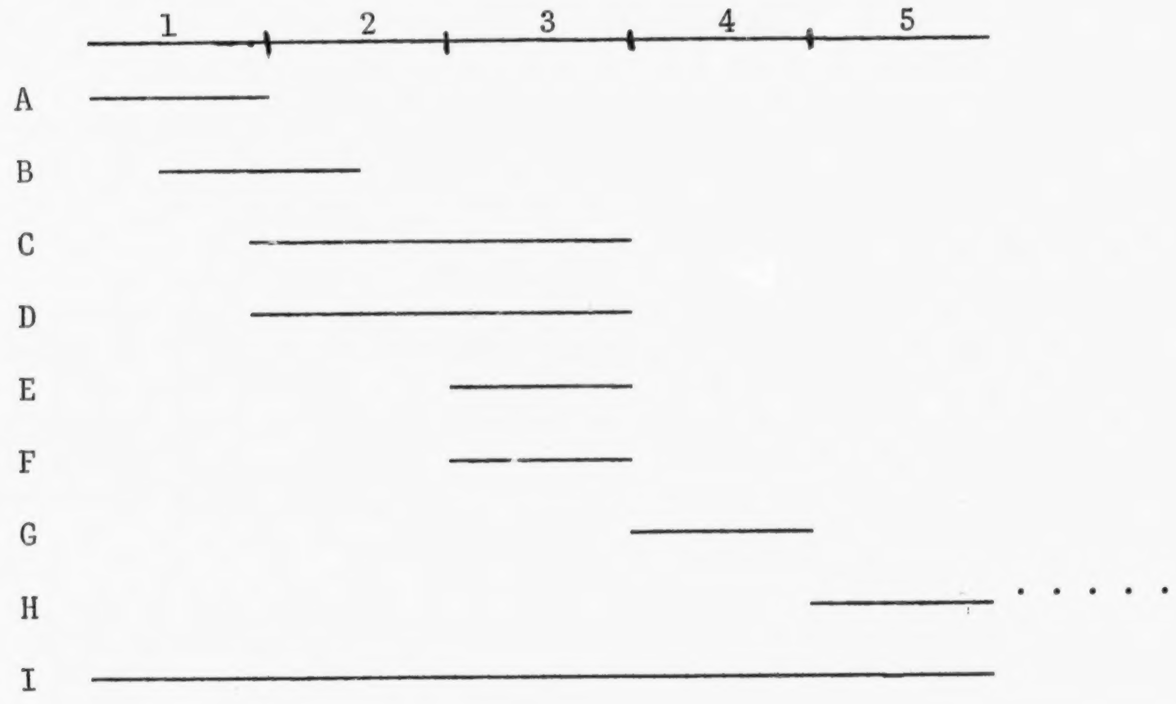
c. To put these two sets of figures together.

FIGURE D.2
SYSTEM IMPLEMENTATION SCHEDULE

SYSTEM ACTIVITIES

A	Planning
B	Choice of processing formats
C	Original cataloging input module
D	Development of file control systems
E	Cataloging products output
F	Acquisition lists and statistics capability
G	Test
H	State Library Catalog
I	Existing commitments to regional libraries

QUARTERS



The results of such estimations are clearly approximate, but nevertheless a structure or model for computing total costs is exhibited. Alternate figures for unit costs or volumes can easily be entered into the model if desired.

The functions into which the system shown in Figure D.1 may be broken down are taken as the following:

a. Cataloging. Cataloging of those items for which no MARC data is found (δQ).

b. Manual.

   (i) Manual entry of requests for catalog products into machine-readable form; i.e., keypunching and verification (ΔQ).

   (ii) Entry of catalog data from (a) into machine-readable form (δQ).

c. MARC subscription. The cost of the weekly MARC tape service from the Library of Congress.

d. Storage. The four major files M, Q, P, H must be maintained on some storage medium. Magnetic tape back-up must be provided for reliability. Storage on magnetic tape, off-line and on-line disc will be considered.

e. Processing. Processing consists of a number of functions:

   (i) Sorting only occurs on entry of small files into system and will be ignored.

   (ii) Merging.

   (iii) Matching.

f. Output. Line printer output will be considered for all new data entering the system in machine-readable form, or for increments to existing files, etc.

g. Salaries. A figure for salaries will be assumed other than for the clerical or keypunch staff included in (b) above.

Flows are estimated in Table D.5. Units are characters or characters/week, and n is the number of weeks into the project. Unit costs are estimated in Table D.6. Flows and costs are consolidated in Table D.7 from which the costs of three different systems per week can be estimated, based upon differences in storage medium.

TABLE D.5
CALCULATION OF SYSTEM FLOWS
(Data from Exhibits 1 and 2)

a. Cataloging

Original cataloging	600 records/week
30,000/year = 600/week	

b. Manual

(i) Request for catalog products 300,000/year = 600/week	300,000 characters/week
(ii) Entry of original cataloging 600 x 500 = 300,000	300,000 characters/week

c. MARC Subscription

Not applicable

d. Storage

MARC cumulative file (M) (1200/week) x n weeks x 500 = 600,000 n	600,000 n characters
Holdings cumulative file (H) 37.5 x 10^6/50 = 750,000	750,000 n characters
Query file (Q)	2,400,000 characters
In-process file (P)	18,000,000 characters

e. Processing

(i) Sorting - ignored

(ii) Merging is estimated by character count of files merged, on a weekly basis.

Query file (Q)	2,400,000 characters
Query file increment (ΔQ)	300,000 characters
MARC file (M)	600,000 n characters
MARC file increment (ΔM)	600,000 characters
Various inputs to inprocess file (= ΔP)	3,000,000 characters
In-process file (P)	18,000,000 characters
In-process file increment (ΔP)	3,000,000 characters

TABLE D.5, cont.
CALCULATION OF SYSTEM FLOWS

Holdings file (H)	750,000 n characters
Holdings file increment (ΔH)	750,000 characters

(iii) Matching is estimated as merging.

Total query file (ΣQ)	2,700,000 characters
Total MARC file (ΣM)	600,000 n + 600,000 characters
Total query file (ΣQ)	2,700,000 characters
In-process file (P)	18,000,000 characters
Total query file (ΣQ)	2,700,000 characters
Holdings file (H)	750,000 n characters
Receipt cards (DR)	300,000 characters
Total in-process file (ΣP)	21,000,000 characters

f. Output (the following files are printed out weekly, for one purpose or another)

Query file increment (ΔQ)	300,000 characters
MARC file increment (ΔM)	600,000 characters
In-process file increment (ΔP)	3,000,000 characters
Holdings file increment (ΔH)	750,000 characters
Receipt cards (ΔR)	300,000 characters
Cataloging Products (ΔCP) (1,000 characters/record estimate)	6,000,000 characters

g. Salaries

Technical and other specialist salaries allocated to systems costs.

TABLE D.6
CALCULATION OF SYSTEM UNIT COSTS
(Data estimated and from Data Processing Service Center)
(Figures are rounded for convenience at right)

a. Cataloging $3.00/title
Figure used in Chapter VI

b. Manual $550/$10^6$ characters
10,000 characters/hour at $5.50/hour for keypunch and verify

c. MARC subscription $16/week
$800/year = $16/week

d. Storage

(i) Magnetic tape

Service Center rate = $1.00/mo for 2400' tape $.01/$10^6$ characters/week
Assuming 800 bpi density,
Capacity = $2400 \times 12 \times 1600 = 46 \times 10^6$ characters

(ii) Off-line disc $1.00/$10^6$ characters/week

Service Center rate = $.50/mo for 2314 disc cylinder
Cylinder = Pack/200 = 1.5×10^5 characters

(iii) On-line disc $10/$10^6$ characters/week

As (ii) but $5.00/mo

e. Processing $.50/$10^6$ characters
Cost of merging and matching is assumed to be primarily input/output and movement of characters.
Estimate based on 20 microrecords per character of input files, and $100/hr equivalent billing rate for 360 Model 50.

Rate = $\frac{100}{3600 \times 50{,}000}$ \$/character

f. Printing $11.00/$10^6$ characters
Estimate is based on running 1403 Printer at 1100 lines/minute, 75 characters/line average and $15/hour equivalent billing rate.

Rate = $\frac{15}{60 \times 300 \times 75}$ \$/character

g. Salaries $1,000/week
Assume $50,000/yr

System based on magnetic tape	$3,055 + n/week
System based on off-line disc	$3,075 + 2n/week
System based on on-line disc	$3,255 + 14n/week

These figures are shown in graphical form in Figure D.3. From them and from those of Table D.7 a number of conclusions can be drawn.

Magnetic tape and off-line disc offer systems of comparable cost. On-line disc storage leads to progressively higher costs as time passes. Costs consist of two components, one fixed and one cumulative, the latter reflecting the growth of cumulative data files.

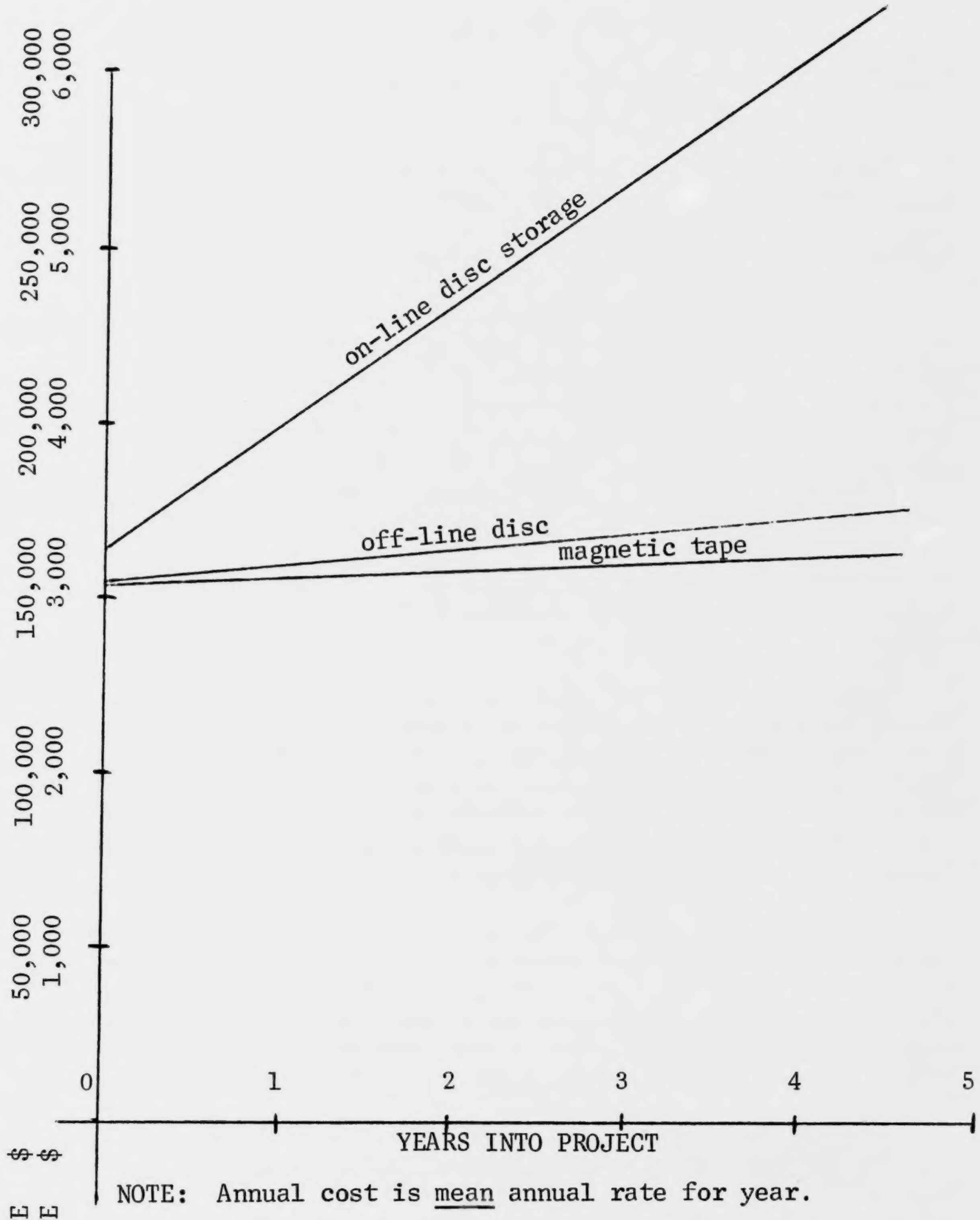
Taking the off-line disc system as an example, the weekly cost varies from about $3,050 to $3,150 during the first year with a mean of $3,100. In the second and third years the mean costs are $3,200 and $3,300 per week. These correspond to annual figures of about $155,000, $160,000 and $165,000 respectively. These are much less than the anticipated ideal savings of almost $700,000 from centralization of cataloging shown in Table 1. Furthermore, this figure includes the cost of cataloging 73,000 titles at $3.00/title in the centralized system, about $220,000/year. Thus, the $700,000 can be regarded as savings due to centralization which are conserved by an off-line disc computer system since its costs are even less than those of a centralized manual system.

A comparison of the costs of current, regional and centralized manual systems with the proposed automated system is shown in Figure D.4. These assume that current salaries, material costs, and yearly volumes acquired do not change, nor storage costs. In fact, it is likely that the latter will decrease and the remainder increase with time. The manual costs are for cataloging at $3.00 per title, and the figures are obtained from Chapter 3.

Another point is that the cost of the machine components of the proposed system is only a small proportion of the total cost. Even if the figures shown are increased by a factor of 2 or 3, total costs are still dominated by cataloging costs and salaries. This means that a high-level programming language can probably be afforded, rather than having to stay with assembly language on the grounds of cost.

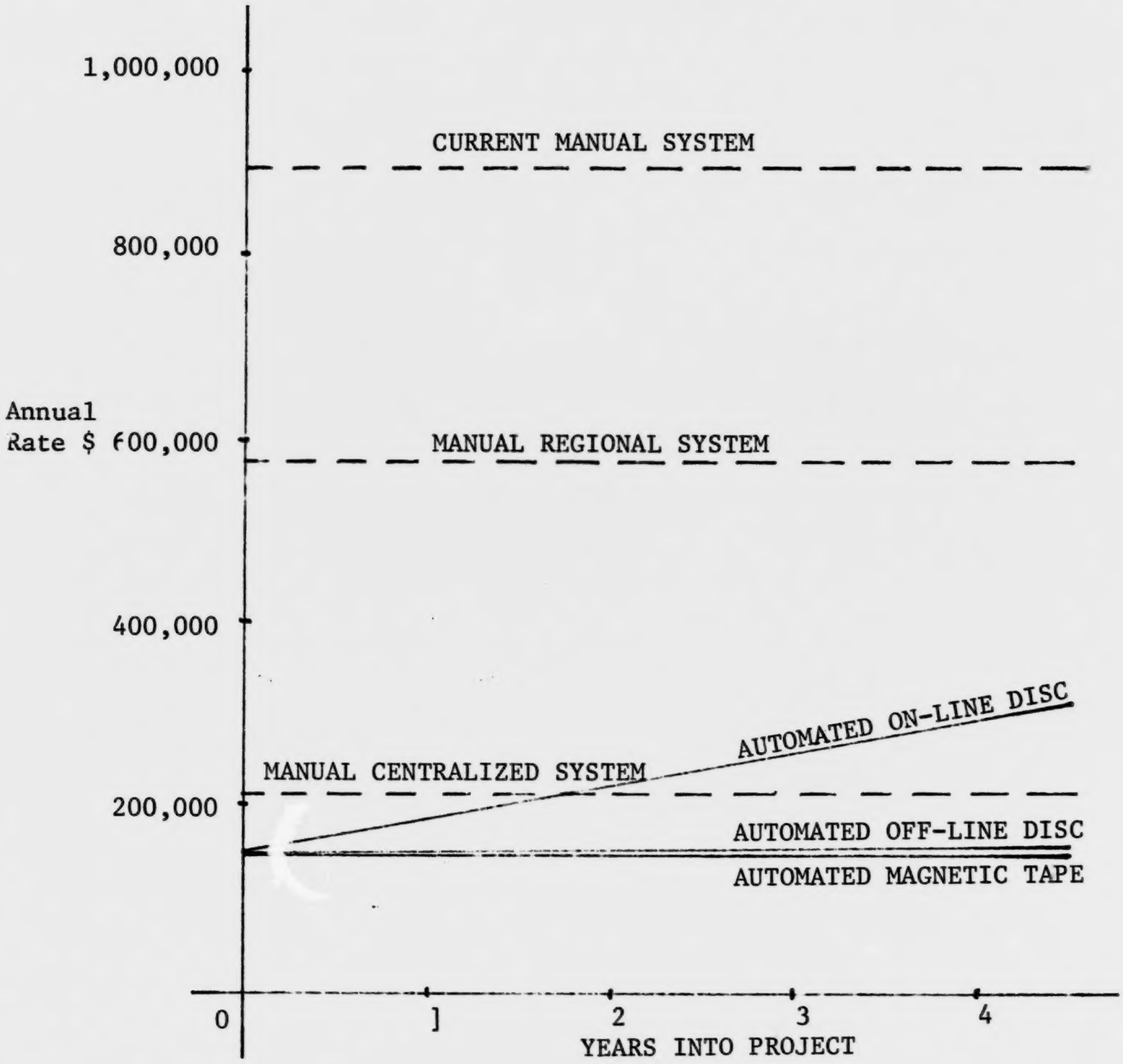
Storage costs show a hundredfold increase in going from magnetic tape to off-line disc, and tenfold in going to on-line disc. However, when seen in relation to the total system cost, or even in absolute dollar figures, off-line storage costs are slight; and even using on-line disc, a needless luxury at the present time, is not prohibitive.

In the off-line disc system, the machine-based costs for storage, processing, and printing are comparable, and this suggests that an attempt should be made to refine these estimates to see if one becomes dominant.



NOTE: Annual cost is mean annual rate for year.

FIGURE D.3
PROJECTED TOTAL AUTOMATED SYSTEMS COSTS



NOTE: ANNUAL COST IS MEAN ANNUAL RATE.

FIGURE D.4 COMPARISON OF AUTOMATED AND MANUAL COSTS

TABLE D.7
SYSTEM COSTS BY FUNCTION

Note: Flows are consolidated for each function.
Units are characters per week except for cataloging.
Three sets of back-up files are assumed.
Cost figures are rounded for convenience and are dollars per week.

FUNCTION	NUMBER OF UNITS	UNIT COST	COST
Cataloging	600	\$3.00	\$1,800
Manual	300,000	\$550/10^6	165
MARC subscription			16
Storage magnetic tape	20.4×10^6 $+1.35\ n \times 10^6$	\$.01/10^6	0
Storage off-line disc	"	\$1.00/10^6	20 + n
Storage on-line disc	"	\$10/10^6	200 + 13 n
Backup files	61.2×10^6 $+4.05\ n \times 10^6$	\$.01/10^6	1
Processing	76.05×10^6 $+2.7\ n \times 10^6$	\$.50/10^6	40 + n
Printing	10.95×10^6	\$3/10^6	33
Salaries			1,000

The cost of back-up tapes for three complete sets of the major files is negligible.

D.6 Further Questions

This section outlines a number of questions that still need to be considered. They lie outside the scope of this appendix either in detail or in time-scale. Of course, if the basic technical system chosen to support the network is very different from that outlined earlier, then some of these questions may not be so pertinent.

a. Design Details. The details of the system design must be settled, e.g., formats, file structures, indexes, processing functions. Essentially, this means that section D.3 must be redone in greater detail if there is acceptance of the basic system objectives.

b. Catalog Production. The uses to which book or printed catalogs could be put in the network needs to be considered carefully. Their form, frequency, and costs should be studied. The question of line printer versus photocomposition versus microform needs to be resolved.

c. Retrospective Cataloging. Apart from the development of a complete machine-based catalog for the State Library, there should be little activity in this area until national policies based on the Library of Congress RECON project begin to develop. However, this is a question which must be considered since the state almost certainly has unique holdings in northwest materials which will remain its cataloging responsibility.

d. Interface Capability. The proposed network is not unique. Numerous other networks or groupings on a national, regional, or state-wide basis are in the process of development. Consideration must be given to the question of how the proposed network in Washington will interface with these. The MARC II format is one embryonic standard. Others are needed.

e. Long-Range Planning. The system discussed in this appendix is only a first step in a continuous process of system development which will go on for years, even decades. Both the objectives and means of long-range system development must be considered. In the area of objectives, there are such features as interface with other systems, expanded system function, and more comprehensive operating data. In the area of means, there are such features as new hardware products, e.g., large cheap storage devices, and new software products, e.g., a suitable special purpose programming language. With technical developments, certain cost constraints could change dramatically.

f. Role of Pacific Northwest Bibliographic Center (PNBC). The recent Currier report on PNBC has considered many aspects of the operation of PNBC, but not those most pertinent to this appendix. The basic question is how can PNBC best be developed in relation to a mechanized system such as the network ultimately envisages. Since the network will provide comprehensive location information (within the state), the best role for PNBC would seem to be as an interstate system, linking a group of independent state systems.

Numbers paint a bleak picture of the future of PNBC as regards automation, and it is worthwhile considering these briefly. The figures below are taken from the Currier report and rounded off slightly.

Number of cards	4,000,000	cards
Additions	320,000	cards/yr.
Withdrawals	250,000	cards/yr.
Requests	20,000	/yr.
Budget (visible)	$ 54,000	/yr.
Budget (invisible support from University of Washington)	$ 34,000	/yr.

The size of the main data file for an automated bibliographic retrieval system would approximate 2×10^9 or 2 billion characters. To convert a file of this size to machine-readable form and maintain it on a random access mass storage device for on-line inquiry is very expensive. It is not clear that the service as represented by 20,000 requests per year is worth the expense.

D.7 Summary

This appendix has discussed a number of technical aspects of the proposed network system from a general point of view.

The main finding is that, given that a centralized manual cataloging system will save \$700,000 annually by avoiding duplication of cataloging effort, then a computer system as described above will not only conserve but actually improve upon these savings. Each type of system will cost about \$200,000 annually. Even in the computer system machine costs are a fraction of total system costs.

Recommendations fall into two areas, one administrative and the other technical.

From an administrative point of view, it is important to build up or create adequate staff competency in the technical area. A machine-based system of the scope being discussed for the network requires technically qualified personnel to work with the design, implementation and operation. Secondly, it is necessary to begin to devise cost formulas and procedures so that the services that the machine-based system will offer can be established in a realistic, even if subsidized, framework.

From a technical point of view, the first thing to do is to begin to build a cumulative bibliographic data bank, an embryonic holdings data bank, based on the current acquisitions of the state's libraries and fed with bibliographic data from MARC or original cataloging. This is the basis for a service to individual libraries of catalog products for their acquisitions, e.g., catalog cards, book cards, spine labels. When this has been set up, the holdings of the State Library will be converted to a machine-based file and copies distributed widely in some print medium, e.g., photoreduced line printer output or microfiche.

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APPENDIX E
ADMINISTRATIVE DATA QUESTIONNAIRE AND ANALYSIS

This appendix gives details of the administrative data questionnaire, its administration, and the method used for its analysis.

E.1 Questionnaire

The questionnaire went through three preliminary drafts, the last of which was field-tested with a small group of respondents, most of whom were not in the actual sample population. An alerting letter was sent out on December 9, 1969. Three days later the questionnaire together with a covering letter was mailed to the 140 library heads who made up the survey population. These two letters and the questionnaire are shown as Exhibits E.1, E.2, and E.3. Of the 140 questionnaires sent out, 129 were returned, and of these, 119 were usable. In order to test the representativeness of the usable returns against the original sample, both were broken down by type of library, and the figures are shown in Table E.1. It should be noted that the categorization by type of library in the administrative study is not the same as is used in the rest of the study, e.g., Chapters 2-4.

The questionnaire was divided into three parts: the library of the respondent; personal interaction survey; and network opinion survey; and data from each section were coded for machine analysis. In addition, data from the second part were used directly for the sociometric analysis of section 5.4.

E.2 Coding of Data

Data for machine analysis were copied from each usable questionnaire onto a worksheet, using a scheme for data coding developed for the purpose. The worksheet and the data coding guide are shown as Exhibits E.4 and E.5. Data elements 4-6 (population serviced, size of collection and annual expenditure) were obtained from additional published statistical data. Data elements 2, 3, 8 (type of support, geographic area, status of librarian) were obtained indirectly from other specific answers. Data element 7 (characteristics of the librarian) was derived from the answers to part 2 of the Questionnaire, see also section 5.4.

E.3 Computer Analysis

Data were analyzed by a packaged program at the State Data Processing Service Center. The program used was BMDO2S, Contingency Table Analysis, from the Health Sciences Computing Facility, UCLA, version of June 15, 1966.

Data were punched from the worksheets onto cards, two cards for each worksheet, using 136 consecutive columns, and input to the program using Fortran format (3X, 2F1.0, 73F1.0/56F1.0), thus skipping the library identification code. The data, therefore, finally comprised 119 records of 132 data elements or variable values per record.

The program computes two-way tables for selected pairs of variables, together with a number of additional functions. When the cells in the table have expected frequencies less than a user-specified limit, then the table is collapsed by merging successive rows and columns until the frequencies have been raised above the limit set. In the present analysis this limit was set at one. For each of the original and collapsed tables, the following output was obtained: count rejects; frequency tables; row, column and table percentages; chi-square and degrees of freedom; contingency coefficient; and the quantity $-2 \log\lambda$, where λ is the maximum likelihood ratio. In addition, a list of the number of rejects for each variable taken singly was obtained. These arise from incompletely filled out questionnaires. The actual analyses chosen were pairwise tables for:

variable 1 v. variable n , n = 2, ...132
variable 2 v. variable n , n = 3, ...132
.
.
.
variable 12 v. variable n , n = 13, ...132
variable 18 v. variable n , n = 19, ...132
.
.
.
variable 22 v. variable n , n = 23, ...132

and variable 33 v. variable n , n = 34, ...132
variable 44 v. variable n , n = 45, ...132
.
.
.
variable 121 v. variable n , n = 122, ...132

These fall into two groups, complete sets of tables for variables 1 (type of library) through 12 (interlibrary loan) and 18 (participation) through 22 (familiarity), and then complete sets of tables for the semantic differential averages only, for a total of 2,561 tables. Collapsed tables were formed in addition for many of these original tables.

E.4. Interpretation of Computer Output

Interpretation of the computer output is based on the values for chi-square and degrees of freedom obtained for each table, either original or collapsed. The chi-square test is a test for statistical independence. Using published tables of the chi-square distribution, it is possible to find the probability that the two variables being compared are independent. Low values of such probability are indicators of a significant lack of statistical independence, and one speaks of significance at the .01 level, for example. The contingency coefficient is a closely related measure which has the advantage of taking values between zero (completely independent) and one (completely dependent).

In general, tests for significance based on collapsed tables are more reliable than those based upon original tables. However, since collapsing results in merging columns and rows, the categorization of the two variables may change in an undesirable way.

An important question is what level of significance to choose. Frequently, a level of .05 or .01 is used. However, in the present case a large number of tables were obtained, in fact just over 2500. This means that 125 tables at the .05 level and 25 tables at the .01 level might be expected to occur randomly without any actual significance. The only way to avoid obtaining large numbers of tables whose levels of significance arose only by chance seemed to be to choose a high enough level of significance. Accordingly, the .001 level was considered. By chance, two or three tables are expected at this level of significance. In fact, there were 60. Therefore, the vast majority of these may be taken as genuinely significant. In contrast, there were about the same number of tables at the .01 level. 25 were expected. It would have been difficult in this case to place confidence in the results since one out of every two significant tables could have arisen randomly without any actual significance. To summarize, therefore, the level of significance used with the chi-square test throughout the data analysis of the next two sections is .001. Table E.2 summarizes all the correlations indicated by a significance level of .001. Unfortunately, many of these correlations are impossible to interpret directly from the significant tables, as explained in chapter 5. More refined methods of data analysis are required.

Tables E.3a to E.3k summarize the basic data on the respondents' libraries obtained through the questionnaire. Not all of the tables presented have 119 entries. This is because some questionnaires were incompletely filled out, leading to missing values for some data variables. This is not serious, except where a large number of values are missing.

TABLE E.1: REPRESENTATIVENESS OF USABLE RETURNS

TYPE OF LIBRARY	ORIGINAL SAMPLE NUMBER	ORIGINAL SAMPLE PERCENT	USABLE RETURNS NUMBER	USABLE RETURNS PERCENT	PERCENT USABLE RETURN
Public	48	34	44	37	92
Community College	22	16	21	17	95
College *	7	5	5	4	71
College-University**	12	9	9	8	75
Special	51	36	40	34	78
TOTAL	140	100	119	100	85

* Colleges offering bachelor's degree only.
** Colleges or universities offering advanced degrees.

TABLE E.2

SUMMARY OF SIGNIFICANT CORRELATION

Following each variable there is a list of variable numbers with which the first shows lack of statistical independence at the .001 level of significance. The numbering is as on the data worksheet and coding guide, Exhibits E.4 and E.5.

1.	Type of library	2,4,5,9,10,11,12,20
2.	Support	1,4,9,10
3.	Geographic area	None
4.	Population served	1,2,5,6,9,10,11,18
5.	Size of collection	1,4,6,8,9,11,12,22
6.	Annual expenditure	4,5,8
7.	Characteristics of librarian	23.10,25.10,29.6,30.4,30.6, 30.9
8.	Professional status of librarian	5,6,24.2,27.2,30.2,31.3, 32.9
9.	Collection emphasis	1,2,4,5,10,11
10.	Clientele needs	1,2,4,9,11
11.	Circulation	1,4,5,9,10,12
12.	Interlibrary loans	1,5,11,24.2,27.4
13.	Infomal interlibrary loans	None
14.	Time lapse	None
15.	Time 1970	None
16.	Time 1973	None
17.	Time 1975	None
18.	Participation	4,23.1,23.4,32.1,32.3,32.6, 32.9,32.11
19.	Recommendation	29.7
20.	Discussion	1,22

TABLE E2: SUMMARY OF SIGNIFICANT CORRELATIONS, CONTINUED

21. Best information		None
22. Familiarity		5,20
23. Network	23.1	18
	23.4	18
	23.10	7
24. Regional centers	24.2	8.12
	24.11	28.11,30.6,30.9,30.11, 31.2
25. Central facility	25.10	7
26. Type of library center		None
27. Interlibrary loan	27.2	8
	27.4	12
	27.11	32.11
28. Centralized processing	28.11	24.11
29. Collection management	29.6	7
	29.7	19
	29.11	30.6,31.2,31.5
30. Facsimile transmission	30.2	8
	30.4	7
	30.6	7,24.11,29.11
	30.9	7,24.11
	30.11	24.11,32.2
31. Reference	31.2	24.11,29.11
	31.5	29.11
32. Union lists	32.1	18
	32.2	30.11
	32.3	18
	32.6	18
	32.9	8,18
	32.11	18,27.11

TABLE E.3a: BASIC DATA ON LIBRARIES
TYPE OF LIBRARY

Type of Library	Number of Libraries	Percent
Public	44	37
Community College	21	17
College*	5	4
College-University**	9	8
Special	40	34
Total:	119	100

* Colleges offering bachelor's degrees only.
** Colleges or universities offering advanced degrees.

TABLE E.3b: BASIC DATA ON LIBRARIES
SOURCE OF SUPPORT

Support	Number of Libraries	Percent
Public	85	71
Private	34	29
Total:	119	100

TABLE E.3c: BASIC DATA ON LIBRARIES
DISTRIBUTION BY REGION

Region	Number of Libraries	Percent
1	6	5
2	12	10
3	6	5
4	16	13
5	30	25
6	3	3
7	7	6
8	8	7
9	4	3
10	14	12
11	3	3
12	10	8
Total:	119	100

TABLE E.3d: BASIC DATA ON LIBRARIES
POPULATION SERVED

Population Served*	Number of Libraries	Percent
Large	12	10
Medium-Large	10	8
Medium-Small	44	38
Small	51	44
Total:	117	100

* For exact population ranges see data coding guide, Exhibit E.5.

TABLE E.3e: BASIC DATA ON LIBRARIES
SIZE OF COLLECTION

Size of Collection*	Number of Libraries	Percent
Large	11	12
Medium-Large	31	32
Medium-Small	24	25
Small	30	31
	96	100

* For exact size ranges see data coding guide, Exhibit E.5.

TABLE E.3f: BASIC DATA ON LIBRARIES
ANNUAL EXPENDITURE

Annual Expenditure*	Number of Libraries	Percent
Large	42	55
Medium-Large	23	30
Medium-Small	11	14
Small	1	1
	77	100

* For exact expenditure ranges see data coding guide, Exhibit E.5.

TABLE E.3g: BASIC DATA ON LIBRARIES
COLLECTION EMPHASIS

Collection Emphasis	Number of Libraries	Percent
Research	19 . . .	16
Recreation	21 . . .	18
Curriculum Supportive . .	36 . . .	30
General Information . . .	29 . . .	25
Special Subject	13 . . .	11
Total:	118	100

TABLE E.3h: BASIC DATA ON LIBRARIES
CLIENTELE NEEDS

Clientele Needs	Number of Libraries	Percent
General Information . . .	34 . . .	29
Research Information . .	37 . . .	32
Recreation	26 . . .	22
Other	20 . . .	17
Total:	117	100

TABLE E.3i: BASIC DATA ON LIBRARIES
CIRCULATION

Circulation	Number of Libraries	Percent
Low	59 . . .	57
Medium-Low	15 . . .	14
Medium.	14 . . .	13
Medium-High	12 . . .	12
High	4 . . .	4
Total:	104	100

* For exact circulation ranges see data coding guide, Exhibit E.5.

TABLE E.3j: BASIC DATA ON LIBRARIES INTERLIBRARY LOANS

Interlibrary Loans/Year	Number of Libraries	Percent
Under 100	50	46
100-200	23	21
200-300	11	10
300-400	6	5
400-500	2	2
Over 500	18	16
Total:	110	100

TABLE E.3k: BASIC DATA ON LIBRARIES INFORMAL INTERLIBRARY LOANS

Informal Interlibrary Loans/Year	Number of Libraries	Percent
None	60	55
1-100	32	29
Over 100	18	16
Total:	110	100

EXHIBIT E.1

UNIVERSITY OF WASHINGTON
Seattle, Washington
98105

School of Librarianship

December 9, 1969

Dear Librarian:

As part of the planning for the Proposed Library Network for the State of Washington, a research project has been initiated by the Washington State Library. The School of Librarianship, along with selected faculty from other disciplines, constitutes the staff for the project.

The concept of the network, it was felt, needed some additional empirical data on which to base the best form, functions, procedures and equipment. Several investigators began working on the study. These were Dr. Robert Meier of the University of Washington School of Business Administration, Dr. Jonathan Stanfield of the University of Washington School of Librarianship, Dr. Roger Miller of the University of Washington Department of Economics and myself. For some months we have been busy collecting and analyzing various data. Now my part of the study requires that I obtain some data which are not available from other sources.

In the near future I will send you a questionnaire. The opinions of administrative heads of the libraries or library systems are vital. I am sure you will find the subject of our study of sufficient importance to future library development that you will take time to complete the questionnaire and return it. Thanks in advance for your assistance.

Sincerely,

William V. Nash

William V. Nash
Associate Professor

WN:mr

EXHIBIT E.2

UNIVERSITY OF WASHINGTON
Seattle, Washington
98105

School of Librarianship

December 12, 1969

Dear Librarian:

Several days ago I wrote you about a study of the Washington State Library Network which is currently under way at the University of Washington. I indicated at that time I would send you a questionnaire. All administrative heads of libraries or library systems in the State are being asked to complete the questionnaire. The questionnaire is enclosed.

The data you supply will enable the research team to study the feasibility of such a network and the most likely form it should assume. Your response is vital! Thanks for cooperating.

The questionnaire employs several kinds of questions. For the most part the question form is based on techniques developed by several researchers of national reputation -- J. L. Moreno and Charles Osgood. These techniques are not widely known in librarianship, but are effective in helping interpret answers.

Outside of myself and a research assistant, answers will be confidential. The research team will receive the data in composite form only and any data appearing in the final report will also be composite.

A self-addressed stamped envelope is enclosed for your convenience. Please return the questionnaire by January 5, 1969 to facilitate the study.

Sincerely,

William V. Nash

William V. Nash
Associate Professor

Enclosure

LIBRARY NETWORK FOR WASHINGTON STATE

EXHIBIT E.3

QUESTIONNAIRE

(All information is strictly confidential.)

Name of respondent ____________________

Name of library ____________________

Address of library ____________________

____

Position of respondent ____________________

Part I - The Library

1. Which of the following phrases characterize your collection? (Rate according to relative emphasis - 0 as not applicable, 1 very limited emphasis, to 7 as major emphasis. Circle the number that indicates your opinion.)

Research emphasis	0	1	2	3	4	5	6	7
Recreation emphasis	0	1	2	3	4	5	6	7
Curriculum supportive emphasis	0	1	2	3	4	5	6	7
General information emphasis	0	1	2	3	4	5	6	7
Special subject emphasis	0	1	2	3	4	5	6	7

Comments: (If any)

2. Clientele needs: Estimate the percentage of your patrons having the following primary library needs.

General information ____________

Research information ____________

Recreational reading ____________

Other (explain) ____________

Total 100%

Comments: (If any)

(All information is strictly confidential.)

3. What was your total circulation during the past fiscal year? ____________

Comments: (If any)

4. How many books were borrowed from other libraries using formal interlibrary loan arrangements during the past fiscal year? ____________

Comments: (If any)

5. How many books were borrowed from other libraries using arrangments other than formal interlibrary loan arrangements during the past fiscal year? ________

Comments: (If any)

6. What is the average response time between the request and receipt of material borrowed via·

(a) Formal interlibrary loan arrangements ______________________________

(b) Other cooperative arrangments ______________________________

Comments: (If any)

7. Bearing in mind cost and other factors, what is a functional realistic goal which should be reached by the end of the calendar year 1970 for the average response time from request of formal interlibrary loan to receipt of the material?

____

By the end of 1973? _________________

By the end of 1975? _________________

Comments: (If any)

(All information is strictly confidential.)

8. On the basis of what you now know, would you like to have your library participate in the Washington State Library Network?

Yes ____________ No ______________

Comments: (If any)

9. Do you feel your organization or institution would concur in your recommendation concerning participation in Washington State Library Network?

Yes ____________ No ______________

Comments: (If any)

(All information is strictly confidential.)

Part II - Personal Interaction Survey - In this part of the questionnaire we are requesting some rather personal information. The objective is to construct a graphic representation of informal communication patterns operating in the profession. While the data you supply is personal, it will be treated confidentially and will be summarized only in composite terms. Please answer each question as frankly as possible. Please do not leave any questions unanswered.

10. During the last year, to whom have you gone most often to discuss significant library administrative matters? With what frequency do these discussions occur? (Daily, weekly, monthly, etc.) (Exclude your immediate family and staff members.)
Please give a name or check the box at the end of the question.

Name ______________________________

Address ______________________________

____

Occupation ______________________________

Frequency ____________________

☐ Turn to no one.

Comments: (If any)

11. During the past 2 years have you spent time discussing the Washington State Library Network with anyone other than individuals at Washington Governor's Conferences on Libraries or other Washington State Library sponsored meetings?

Yes __________ No __________

Comments: (If any)

(If YES, please answer the following questions.
(If No, please answer only #12 and then skip to Part III.)

(All information is strictly confidential.)

12. How did you get your best information on the network? (Rank 1-4 with 1 being the best medium and 4 being the poorest medium.)

Written (personal)	________
Written (published)	________
Oral (personal)	________
Oral (group)	________

Comments: (If any)

13. From whom or what source did your most reliable information come concerning evaluation of the network concept?

Name ____________________

Address ____________________

____

☐ From no one.

Comments: (If any)

14. Who has been your primary discussion partner during the past year in matters pertaining to the network system?

Name ____________________

Address ____________________

____

Occupation ____________________

How frequently have discussions been held? ____________________

☐ No one.

Comments: (If any)

(All information is strictly confidential.)

15. To whom would you go first for additional reliable information concerning evaluation of the network concept?

Name ______________________________

Address ______________________________

____

Occupation ______________________________

☐ No one.

Comments: (If any)

16. Please rate your familiarity with the Washington State Library Network system on the following scale.

Completely familiar:____:____:____:____:____:____:____: Completely unfamiliar

Comments: (If any)

Part III - Network Opinion Survey (Everyone answer these questions.)

The purpose of this part of the questionnaire is to gather information about your impressions of a library network. This is done by having head librarians judge certain concepts against a series of descriptive scales. On each page of this questionnaire you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order. Here is how you are to use these scales:

If you feel that the concept at the top of the page is very closely related to one end of the scale, you should place your check-mark as follows:

fair :__X__:_____:_____:_____:_____:_____:_____: unfair
or
fair :_____:_____:_____:_____:_____:_____:__X__: unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check-mark as follows:

strong:_____:__X__:_____:_____:_____:_____:_____: weak
or
strong:_____:_____:_____:_____:_____:__X__:_____: weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active:_____:_____:__X__:_____:_____:_____:_____: passive
or
active:_____:_____:_____:_____:__X__:_____:_____: passive

The direction toward which you check, or course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging. If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or if the scale is completely irrelevant, unrelated to the concept, then you should place your check-mark in the middle space:

safe :_____:_____:_____:__X__:_____:_____:_____: dangerous

IMPORTANT: (1) Place your check-marks in the middle of spaces, not on the boundaries:

This Not this
safe :______:__X___:_______:________X_______:_______:_______: dangerous

(2) Be sure to check every scale for every concept -- DO NOT OMIT ANY.

(3) Never put more than one check-mark on a single scale.

Sometimes you may feel as though you've had the same item before on the questionnaire. This will not be the case, so do not look back and forth through the items. Do not try to remember how you have checked similar items earlier in the questionnaire. Make each item a separate and independent judgment. Work at fairly high speed through this questionnaire. Do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items that we want. On the other hand, please do not be careless, because we want your true impressions.

(4) A place for your comments is provided at the bottom of each page.

EXHIBIT E.3, cont.

(All information is strictly confidential.)

17. Washington State Library Network.

Useful :____:____:____:____:____:____:____: Useless

Intuitive :____:____:____:____:____:____:____: Rational

Progressive:____:____:____:____:____:____:____: Regressive

Unimportant:____:____:____:____:____:____:____: Important

Inexpensive:____:____:____:____:____:____:____: Expensive

Untimely :____:____:____:____:____:____:____: Timely

Prohibitive:____:____:____:____:____:____:____: Permissive

Possible :____:____:____:____:____:____:____: Impossible

Necessary :____:____:____:____:____:____:____: Unnecessary

Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

Explanation of questions 18-20: The network may assume several administrative forms. For example, there may be regional centers through which loans and services are directed or there may be one central facility. There may be type of library centers (i.e. academic, public, special, or school). Please give your impressions of the following configurations.

18. Regional Centers - A center aiding in information services in several counties or a geographic area.

Useful :_____:_____:_____:_____:_____:_____:_____: Useless

Intuitive :_____:_____:_____:_____:_____:_____:_____: Rational

Progressive:_____:_____:_____:_____:_____:_____:_____: Regressive

Unimportant:_____:_____:_____:_____:_____:_____:_____: Important

Inexpensive:_____:_____:_____:_____:_____:_____:_____: Expensive

Untimely :_____:_____:_____:_____:_____:_____:_____: Timely

Prohibitive:_____:_____:_____:_____:_____:_____:_____: Permissive

Possible :_____:_____:_____:_____:_____:_____:_____: Impossible

Necessary :_____:_____:_____:_____:_____:_____:_____: Unnecessary

Peripheral :_____:_____:_____:_____:_____:_____:_____: Central

Comments: (If any)

(All information is strictly confidential.)

19. Central facility - One central facility for the entire state to assist in processing and information service to local libraries.

Useful :_____:_____:_____:_____:_____:_____:_____: Useless

Intuitive :_____:_____:_____:_____:_____:_____:_____: Rational

Progressive:_____:_____:_____:_____:_____:_____:_____: Regressive

Unimportant:_____:_____:_____:_____:_____:_____:_____: Important

Inexpensive:_____:_____:_____:_____:_____:_____:_____: Expensive

Untimely :_____:_____:_____:_____:_____:_____:_____: Timely

Prohibitive:_____:_____:_____:_____:_____:_____:_____: Permissive

Possible :_____:_____:_____:_____:_____:_____:_____: Impossible

Necessary :_____:_____:_____:_____:_____:_____:_____: Unnecessary

Peripheral :_____:_____:_____:_____:_____:_____:_____: Central

Comments: (If any)

(All information is strictly confidential.)

20. Type of library center - A concept related to regional centers but with different organizational base. One center for all academic libraries, one center for public libraries, one center for school libraries, one for special libraries would serve to facilitate information services in the respective types of libraries.

Useful :_____:_____:_____:_____:_____:_____:_____: Useless

Intuitive :_____:_____:_____:_____:_____:_____:_____: Rational

Progressive:_____:_____:_____:_____:_____:_____:_____: Regressive

Unimportant:_____:_____:_____:_____:_____:_____:_____: Important

Inexpensive:_____:_____:_____:_____:_____:_____:_____: Expensive

Untimely :_____:_____:_____:_____:_____:_____:_____: Timely

Prohibitive:_____:_____:_____:_____:_____:_____:_____: Permissive

Possible :_____:_____:_____:_____:_____:_____:_____: Impossible

Necessary :_____:_____:_____:_____:_____:_____:_____: Unnecessary

Peripheral :_____:_____:_____:_____:_____:_____:_____: Central

Comments: (If any)

(All information is strictly confidential.)

Explanation of questions 21-26: The Washington State Library Network may include several distinct activities. These may include the following: interlibrary loans, centralized processing of both acquisition and classification-cataloging, collection management i.e. development of special collections or collection emphasis and shifting of collections among libraries to meet local needs and demands, facsimile transmission or the sending of copies of materials via electronic menas, the provision of reference and other information services for patrons of other libraries and development of union catalogs to use in location of materials. Please give your impression of each of these services.

21. Interlibrary loans.

Useful :____:____:____:____:____:____:____: Useless

Intuitive :____:____:____:____:____:____:____: Rational

Progressive:____:____:____:____:____:____:____: Regressive

Unimportant:____:____:____:____:____:____:____: Important

Inexpensive:____:____:____:____:____:____:____: Expensive

Untimely :____:____:____:____:____:____:____: Timely

Prohibitive:____:____:____:____:____:____:____: Permissive

Possible :____:____:____:____:____:____:____: Impossible

Necessary :____:____:____:____:____:____:____: Unnecessary

Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

22. Centralized processing - acquiring materials and cataloging-classification.

Useful :____:____:____:____:____:____:____: Useless
Intuitive :____:____:____:____:____:____:____: Rational
Progressive:____:____:____:____:____:____:____: Regressive
Unimportant:____:____:____:____:____:____:____: Important
Inexpensive:____:____:____:____:____:____:____: Expensive
Untimely :____:____:____:____:____:____:____: Timely
Prohibitive:____:____:____:____:____:____:____: Permissive
Possible :____:____:____:____:____:____:____: Impossible
Necessary :____:____:____:____:____:____:____: Unnecessary
Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

23. Collection management -- democratization of materials, development of special collections and/or collection emphasis and shifting of collections to meet local needs and demands.

Useful :____:____:____:____:____:____:____: Useless

Intuitive :____:____:____:____:____:____:____: Rational

Progressive:____:____:____:____:____:____:____: Regressive

Unimportant:____:____:____:____:____:____:____: Important

Inexpensive:____:____:____:____:____:____:____: Expensive

Untimely :____:____:____:____:____:____:____: Timely

Prohibitive:____:____:____:____:____:____:____: Permissive

Possible :____:____:____:____:____:____:____: Impossible

Necessary :____:____:____:____:____:____:____: Unnecessary

Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

24. Facsimile transmission of materials - sending copies via electronic means.

Useful :____:____:____:____:____:____:____: Useless

Intuitive :____:____:____:____:____:____:____: Rational

Progressive:____:____:____:____:____:____:____: Regressive

Unimportant:____:____:____:____:____:____:____: Important

Inexpensive:____:____:____:____:____:____:____: Expensive

Untimely :____:____:____:____:____:____:____: Timely

Prohibitive:____:____:____:____:____:____:____: Permissive

Possible :____:____:____:____:____:____:____: Impossible

Necessary :____:____:____:____:____:____:____: Unnecessary

Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

25. Provision of reference and information services for patrons of other libraries.

Useful :____:____:____:____:____:____:____: Useless
Intuitive :____:____:____:____:____:____:____: Rational
Progressive:____:____:____:____:____:____:____: Regressive
Unimportant:____:____:____:____:____:____:____: Important
Inexpensive:____:____:____:____:____:____:____: Expensive
Untimely :____:____:____:____:____:____:____: Timely
Prohibitive:____:____:____:____:____:____:____: Permissive
Possible :____:____:____:____:____:____:____: Impossible
Necessary :____:____:____:____:____:____:____: Unnecessary
Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

26. Union lists to faciliate location of materials.

Useful :____:____:____:____:____:____:____: Useless

Intuitive :____:____:____:____:____:____:____: Rational

Progressive:____:____:____:____:____:____:____: Regressive

Unimportant:____:____:____:____:____:____:____: Important

Inexpensive:____:____:____:____:____:____:____: Expensive

Untimely :____:____:____:____:____:____:____: Timely

Prohibitive:____:____:____:____:____:____:____: Permissive

Possible :____:____:____:____:____:____:____: Impossible

Necessary :____:____:____:____:____:____:____: Unnecessary

Peripheral :____:____:____:____:____:____:____: Central

Comments: (If any)

(All information is strictly confidential.)

Comments: (If any) This sheet may be used for any type of comments that you might wish to express that you were not able to express in the other parts of the questionnaire regarding the network, the questionnaire in general, etc.

Please return questionnaire to:
William V. Nash
Associate Professor
School of Librarianship
University of Washington
Seattle, Washington 98105

DATA WORKSHEET EXHIBIT E.4

Library code ____ 0 ____

Type of library ____ 1 ____

Private or public support ____ 2 ____

Geographic area ____ 3 ____

Population served ____ 4 ____

Size of collection ____ 5 ____

Annual expenditure ____ 6 ____

Characteristics of librarian ____ 7 ____

Professional status of librarian ____ 8 ____

Collection emphasis ____ 9 ____

Clientele needs ____ 10 ____

Circulation ____ 11 ____

Interlibrary loans ____ 12 ____

Informal interlibrary loans ____ 13 ____

Time lapse ____ 14 ____

Time 1970 ____ 15 ____

Time 1973 ____ 16 ____

Time 1975 ____ 17 ____

Participation ____ 18 ____

Recommendation ____ 19 ____

Discussion ____ 20 ____

Best information ____ 21 ____

Familiarity ____ 22 ____

Network ____ 23 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Regional centers ____ 24 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Central facility ____ 25 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Type of library center ____ 26 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Interlibrary loan ____ 27 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Centralized processing ____ 28 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11
(29-32 see side of page)

Collection management ____ 29 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Facsimile transmission ____ 30 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Reference ____ 31 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

Union Lists ____ 32 __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11

DATA CODING GUIDE

EXHIBIT E.5

DATA ELEMENT NUMBER	DATA ELEMENT NAME	DATA ELEMENT CODE	DATA ELEMENT VALUE	
0	Library Code	1-140	Assigned library identification code	
1	Type of Library	1	Public	
		2	Community College	
		3	College (bachelor's degree only)	
		4	College-university (advanced degrees)	
		5	Special	
2	Support	1	Public	
		2	Private	
3	Geographic area by county (Bowerman region)	1	Clallam, Jefferson, Kitsap	
		2	Grays Harbor, Mason, Thurston, Lewis, Pacific	
		3	Cowlitz, Clark, Skamania, Klickitat, Wahkiakum	
		4	Pierce	
		5	King	
		6	Snohomish, Island	
		7	Skagit, Whatcom, San Juan	
		8	Kittitas, Yakima	
		9	Chelan, Douglas, Grant, Skanogan, Ferry	
		10	Stevens, Spokane, Lincoln, Adams, Pend Oreille	
		11	Whitman, Garfield, Asotin	
		12	Columbia, Walla Walla, Franklin, Benton	
4	Population Served		PUBLIC:	ACADEMIC:
		1	Over 100,000	Over 10,000
		2	25,000-100,000	5,000-10,000
		3	5,000-25,000	1,000-5,000
		4	Under 5,000	Under 1,000
5	Size of Collection		PUBLIC	ACADEMIC
		1	Over 150,000	Over 500,000
		2	25,000-150,000	100,000-500,000
		3	6,000-25,000	50,000-100,000
		4	Under 6,000	Under 50,000
6	Annual Expenditure	1	Over $100,000	
		2	$25,000-100,000	
		3	$4,000-25,000	
		4	Under $4,000	
7	Characteristics of librarian	1	Isolate	
		2	Localite	
		3	Library localite	
		4	Cosmopolite	
		5	Library cosmopolite	

DATA CODING GUIDE

EXHIBIT E.5, cont.

DATA ELEMENT NUMBER	DATA ELEMENT NAME	DATA ELEMENT CODE	DATA ELEMENT VALUE
8	Professional status of librarian	1	Professional
		2	Non-professional
9	Collection emphasis	1	Research
		2	Recreation
		3	Curriculum supportive
		4	General information
		5	Special subject
10	Clientele needs	1	General information
		2	Research information
		3	Recreation
		4	Other
11	Circulation	1	Under 50,000
		2	50,000-100,000
		3	100,000-250,000
		4	250,000-1,000,000
		5	Over 1,000,000
12	Interlibrary loans	1	Under 100
		2	100-200
		3	200-300
		4	300-400
		5	400-500
		6	Over 500
13	Informal interlibrary loans	1	None
		2	1-100
		3	Over 100
14	Time lapse for interlibrary loan	1	0-3 days
		2	4-7 days
		3	8-14 days
		4	15-30 days
		5	Over 30 days
15	Time lapse 1970	1	1 day
16	Time lapse 1973	2	2-3 days
17	Time lapse 1975	3	4-7 days
		4	Over 8 days
18	Participation	1	No
		2	Yes
19	Recommendation	1	No
		2	Yes
20	Discussion	1	No
		2	Yes

DATA CODING GUIDE

EXHIBIT E.5, cont.

DATA ELEMENT NUMBER	DATA ELEMENT NAME	DATA ELEMENT CODE	DATA ELEMENT VALUE
21	Best information	1 2 3 4	Written personal Written published Oral personal Oral Group
22	Familiarity	1-7	From scale marked
23 24 25 26 27 28 29 30 31 32	Network Regional centers Central facility Type of library center Interlibrary loan Centralized Processing Collection management Facsimile transmission Reference Union lists		SEMANTIC DIFFERENTIAL. Each of the data elements 23-32 has 11 subelements, 10 for the components of the semantic differential (useful, intuitive, progressive, important, expensive, timely, permissive, possible, necessary, central) and one for the average. Each subelement takes a value 1-7 taken from the check on the appropriate scale in the questionnaire. The terms above are the positive poles of the semantic differential scales, irrespective of the direction of the scale on the questionnaire

APPENDIX F
ALTERNATE LIBRARY SYSTEM CONFIGURATIONS -- COMPUTER PROGRAM

Evaluation of alternate library system configurations requires that estimates be made of the operating characteristics of both present and proposed systems. Since necessary calculations are lengthy and must be repeated as data are refined and new concepts are developed, a computer program has been written to perform the calculations. The program is written in FORTRAN IV and has been run on the CDC 6400 computer at the University of Washington. It can be run on any computer with a FORTRAN IV compiler. Costs of running the program are modest with a typical compile and execute run of the program costing less than $10.00.

F.1 Program Structure

The program is designed to permit rapid calculation of certain operating characteristics of alternate network configurations. Configurations included in the program are the present system of individual libraries, a regionally oriented network, and a state-wide network. The program ensures that all analyses are derived from a consistent set of base data and formalizes the method of analysis. In effect, the program serves as a model of the relationship between relevant parameters of alternate systems under study. The program permits changes in the base data or method of analysis and rapid rerun of the computations to observe effects of such changes. While the computations in the program are quite elementary and can easily be accomplished with a desk calculator, the speed of calculation possible with a digital computer offers the opportunity for much more refinement of computation and experimentation with alternate methods of calculation. The current version of the program is the result of evolutionary development and refinement over a period of some six months.

The program consists of a main routine called NETWORK and four subroutines called INPUT, INTLOAN, TECHSER, AND COLMGMT. The main routine NETWORK performs no function other than to call the other subroutines. The subroutine INPUT handles input data only and performs no analytical calculations; the other subroutines deal with inter-library loans, technical services, and collection management respectively. INPUT supplies data to the three other subroutines and must always be included in a run of the program. However, INTLOAN, TECHSER, and COLMGMT are completely independent from one another and can be deleted from a run simply by removing the card with the calling statement from NETWORK. This modular construction permits development and experimentation with one part of the program without the expense of rerunning the entire program. Descriptions of the subroutines are given in the following sections of this appendix. NETWORK has not been described further since it is merely a set of calls to the subroutines. A complete listing of the entire program is given in Section F.7 of this appendix. Because of space limitations, complete output from the program has not been included in this report. Summaries of the results of the calculations are shown in Tables 2.7, 3.4 and 4.10.

F.2 Subroutine INPUT

Input to the program is a deck of cards containing data for each library followed by a blank card and a deck giving the names of the different types of libraries in the system. Two cards are used per library with information punched as shown in Figure F.1. The libraries do not need to be in any particular order in the data deck. The two cards for each library, however, must be kept together and in order. All data except for the library names and library types are punched with a decimal point and may be placed anywhere in the fields shown in Figure F.1. Information on the cards is described in greater detail below.

Library Card 1:

Library (Cols. 1-10) - Name of library. Libraries may not be given identical names.

Type (Cols. 11-13) - Type of library numerically coded as follows:
1. Public libraries
2. University libraries
3. College libraries
4. Community college libraries
5. State libraries

Region (Cols. 14-16) - Geographic region number in which library is located.

Patrons (Cols. 17-25) - Number of patrons served by library.

Volumes (Cols. 26-34) - Number of volumes in library.

Titles (Cols. 35-43) - Number of different titles in library.

Volumes acquired (Cols. 44-52) - Number of volumes acquired in past year.

Titles acquired (Cols. 53-61) - Number of titles acquired in past year.

Regional titles (Cols. 62-70) - Number of unique titles in library on a regional basis.

State titles (Cols. 71-79) - Number of unique titles in library on a state-wide basis.

Library Card 2:

Library (Cols. 1-10) - Name of library.

Borrowings (Cols. 17-25) - Number of volumes borrowed by library in past year.

Library Type Card:

Type (Cols. 1-10) - Name of type of library designated by type code. First card gives name of type 1, second card type 2, etc.

As data concerning each library is read in, it is immediately printed out in list form as shown under RUN INPUT DATA in Figure F.2. Total number of libraries and number of regions are also tabulated and printed out. Libraries are then sorted by type and individual, regional, and state-wide statistics are printed out for each library type. Data are then summarized and printed out by region and in total for all library types taken together. Output is shown under STATISTICS in Figure F.2.

F.3 Subroutine INTLOAN

INTLOAN calculates the amount and costs of interlibrary loans for the present system, a regional network, and a state-wide network. Costs are the sum of borrowings costs of the receiving libraries and lending costs of the lending libraries.

The number of volumes borrowed is input data for each library and is assumed to be the same for all systems. Undoubtedly borrowings would rise with better organized systems such as the regional and state-wide networks, but for purposes of comparison this increase has not been estimated. The cost of borrowings is estimated to be $4.50 per volume and is assumed to be the same for all types of libraries.

For the present system, lending activity of the ten libraries in the state with any significant amount of interlibrary loans is estimated

by NLOANSX = NTSVLBR x p_i

where NLOANSX = number of loans made by one of the top eight libraries.

NTSVLBR = number of total volumes borrowed in the state.

p_i = proportion of total loans in the state made by library i of the eight lending libraries

```
FRI. HBR.          1    7     780     8786     8522     676     636     170      85      0
LYNDEN             1    7    2950     8221     8191     397     373     164      82     11
LACONNER           1    7     675     7616     7387     249     234     146      74      0
FERNDALE           1    7    2100     4813     4668     261     246      94      47      0
CONCRETE           1    7     700     4624     4485     335     315      90      45     75
C. WASH.           3    8    9832   159158   110001   17817   12314  110001    4477    625
YAK. V. R.         1    8  148745   240559   101588   11047    4630   62609    4724    980
ELLENSBURG         1    8   13800    27859    24225    2265    1315    6192     485    243
YAKIMA V.          4    8    3320    24493    20382    2175    1814    2397     408    100
SELAH              1    8    3300    17819    17283    2281    2146    2074     173      0
TOPPENISH          1    8    6000    15992    13906     750     634     695     139     65
GRANDVIEW          1    8    3800    12367    11995     461     434     240     120    116
CLE ELUM           1    8    1800     4345     4214      38      36      84      42     10
N. CEN. R.         1    9  124259   265491    64029   20687    2335   64029    1284   1864
EPHRATA            1    9    6800    30194    26256    1064     899   15982     525    147
WENAT. V.          4    9    1783    28180    19434    3919    2701   10970     194    150
BIG BEND           4    9    1177    19111    14792    3821    2958    6452     148    100
BREWSTER           1    9    1157     4953     4804     194     183    1402      48     56
SPOKANE P.         1   10  188500   389332   181023   21134    6009  181023   32150    760
E. WASH.           3   10    6223   130479    87368    3552    2378   56300    1748    900
SPOKANE C.         1   10  105892   104361    72122   11881    6982   24839    3202    253
SPOKANE            4   10    4615    41268    22392    4800    2597   13724     448     30
DAVENPORT          1   10    1460    12750    12367     385     362     247     124    160
RITZVILLE          1   10    1800    10945    10616     502     472     212     106    100
COLVILLE           1   10    3770     9750     9457     384     361     190      95    113
OTHELLO            1   10    3962     8522     8266     593     558     166      83    462
WILBUR             1   10    1007     6331     6141     526     495     124      61    287
CHEWELAH           1   10    1535     6178     5992     404     380     120      60    133
KETTLE F.          1   10     920     5870     5694    1552    1460     114      57     20
ODESSA             1   10    1250     5226     5069     151     142     102      51      9
EDWALL             1   10     125     4508     4372     169     159      88      44     20
REARDAN            1   10     359     3638     3529     224     211      70      35     43
METALINES          1   10     710     3246     3148     168     158      64      31     69
HARRINGTON         1   10     600     2346     2275     217     204      46      23      7
SPRAGUE            1   10     520     1835     1780      68      64      36      18     59
SPRINGDALE         1   10     213      930      902      13     112      18       9      0
WASH. ST.          2   11   15656   805330   283052   38045   13371  283052   81264    375
WHITMAN C.         1   11   15249    65348    53525    3734    2877   32939    1071    439
ASOTIN C.          1   11   14055    23221    22671     939     880    6899     453    105
PULLMAN            1   11   20500    24822    21499    2447    2117    4299     430    103
POMEROY            1   11    2200     8298     8048     187     181     805      80     50
ASOTIN             1   11     745     5344     5183     126     119     260      52      0
RICHLAND           1   12   28900    80602    78523    4781    2893   78523    1570    328
MID-COL. R         1   12   71720   125206    73741   14709    3847   28744    1474    404
WALLA WAL          1   12   26500    54179    51945    2884    2573   14986    1039    122
PASCO              1   12   17000    52634    38223    3144    2168    6647     764    270
COL. BASIN         4   12    2855    20923    16194    2300    1781   10306     162     80
PROSSER            1   12    3075    15823    15347     882     830    1535     153     62
WALLA WAL.         4   12    1380    16231    12563    8009    6193    5025     126     20
DAYTON             1   12    3100     8856     8599     259     244     430      86     12
WAITSBURG          1   12    1070     2246     2178     167     157      66      22     12

      STATE TOTAL             3416716 10236625  4623199  743353  299569 2988600 1128865  32637


TOTAL NUMBER OF LIBRARIES IN RUN - 106
TOTAL NUMBER OF REGIONS IN RUN - 12
```

FIGURE F.2, cont.

5

STATISTICS

PUBLIC LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
REGION 1								
KITSAP RG.	102800	162084	59160	13491	4207	59160	1184	375
P. ANGELES	16125	43489	37817	2702	2284	20731	756	220
CLALLAM C.	17375	50204	36458	3727	2572	16031	729	300
P. TOWNS.	5425	22983	19985	697	589	6995	200	394
REGION TOTAL	141725	278760	153420	20617	9652	102917	2869	1289
REGION 2								
TIMBER. R.	205888	399709	105000	26134	5432	57152	3990	2005
CHEHALIS	5565	25846	22475	1312	1109	3908	450	149
SHELTON	6450	17729	15417	789	667	771	154	395
TENINO	964	5163	5008	138	130	150	50	46
REGION TOTAL	218867	448447	147900	28373	7338	61981	4644	2595
REGION 3								
LONGVIEW	29550	73297	63617	5829	3918	63617	1272	409
FT VAN. R.	127727	183455	43387	7008	2144	20995	868	327
CAMAS	6075	32912	28619	1723	1118	8709	572	240
KELSO	10600	54567	22043	1212	1025	3306	441	239
GOLDENDALE	2860	8214	7967	394	371	398	80	198
CSTL. ROCK	1490	6824	6619	268	252	265	66	4
WHITE SAL.	1565	6455	6261	180	169	126	63	110
KALAMA	1215	4523	4387	200	188	88	44	0
CATHLAMET	660	4508	4371	164	154	88	44	0
REGION TOTAL	181742	374753	187271	16978	9339	97592	3450	1527
REGION 4								
TACOMA P.	161000	476153	149586	25072	8326	149586	8721	221
PIERCE C.	203774	208943	70204	23982	6045	28215	1404	1642
PUYALLUP	15000	33024	28837	2286	1932	2509	577	137
MILTON	2800	9259	8984	911	857	449	90	0
REGION TOTAL	382574	727379	257611	52251	17160	180759	10792	2000
REGION 5								
SEATTLE P.	591000	1375069	387677	76535	11305	211827	211827	737
KING C.	472630	762106	91853	105437	5270	15578	2462	5473
RENTON	26400	73453	59621	9534	6709	8228	1192	57
AUBURN	21300	32677	28415	5201	4396	1175	568	148
ENUMCLAW	4135	12735	12352	1052	990	248	124	202
REGION TOTAL	1115465	2256040	579918	197759	28670	237056	216173	6617
REGION 6								

EVERETT P.	57172	127989	103927	7219	5308	103927	3107	170
SNO-ISLE R	220655	206530	77006	21662	6694	39828	1540	2087
SNOHOMISH	4990	15418	14954	1289	1213	2360	150	73
REGION TOTAL	282817	349937	195887	30170	13215	146115	4797	2330
REGION 7								
BELLINGHAM	38000	124011	88769	6769	3993	49604	1776	239
WHATCOM C.	43530	88249	53489	3261	1727	15731	1070	54
MT VERNON	8500	30444	26473	1745	1475	6340	529	131
ANACORTES	9120	19843	17255	707	598	2588	173	374
BURLINGTON	3185	13046	12654	1053	991	1265	127	70
SEDRO WOL.	4140	13041	12649	821	772	633	126	85
EASTSOUND	1000	12405	12032	1039	977	360	120	15
FRI. HBR.	780	8786	8522	676	636	170	85	0
LYNDEN	2950	8221	8191	397	373	164	82	11
LACONNER	675	7616	7387	249	234	146	74	0
FERNDALE	2100	4813	4668	261	246	94	47	0
CONCRETE	700	4624	4485	335	315	90	45	75
REGION TOTAL	114680	335099	256574	17313	12337	77185	4254	1054
REGION 8								
YAK. V. R.	148745	240559	101588	11047	4630	62609	4724	980
ELLENSBURG	13800	27859	24225	2265	1915	6192	485	243
SELAH	3300	17819	17283	2281	2146	2074	173	0
TOPPENISH	6000	15992	13906	750	634	695	139	65
GRANDVIEW	3800	12367	11995	461	434	240	120	116
CLE ELUM	1800	4345	4214	38	36	84	42	10
REGION TOTAL	177445	318941	173211	16842	9795	71894	5683	1414
REGION 9								
N. CEN. R.	124259	265491	64029	20687	2335	64029	1284	1864
EPHRATA	6800	30194	26256	1064	899	15982	525	147
BREWSTER	1157	4953	4804	194	183	1402	48	56
REGION TOTAL	132216	330638	95089	21945	3417	81413	1857	2067
REGION 10								
SPOKANE P.	188500	389332	181023	21134	6009	181023	32150	760
SPOKANE C.	105892	104361	72122	11881	6982	24839	3202	253
DAVENPORT	1460	12750	12367	385	362	247	124	160
RITZVILLE	1800	10945	10616	502	472	212	106	100
COLVILLE	3770	9750	9457	384	361	190	95	113
OTHELLO	3962	8522	8266	593	558	166	83	462
WILBUR	1007	6331	6141	526	495	124	61	287
CHEWELAH	1535	6178	5992	404	380	120	60	133
KETTLE F.	920	5870	5694	1552	1460	114	57	20
ODESSA	1250	5226	5069	151	142	102	51	9
EDWALL	125	4508	4372	169	159	88	44	20
REARDAN	359	3638	3529	224	211	70	35	43
METALINES	710	3246	3148	168	158	64	31	69
HARRINGTON	600	2346	2275	217	204	46	23	7
SPRAGUE	520	1835	1780	68	64	36	18	59
SPRINGDALE	213	930	902	13	112	18	9	0
REGION TOTAL	312623	575768	332753	38371	18129	207459	36149	2495
REGION 11								

FIGURE F.2, cont.

WHITMAN C.	15249	65348	53525	3734	2877	32939	1071	439
ASOTIN C.	14055	23221	22671	939	880	6899	453	105
PULLMAN	20500	24822	21499	2447	2117	4299	430	103
POMEROY	2200	8298	8048	187	181	805	80	50
ASOTIN	745	5344	5183	126	119	260	52	0
REGION TOTAL	52749	127033	110926	7433	6174	45202	2086	697
REGION 12								
RICHLAND	28900	80602	78523	4781	2893	78523	1570	328
MID-COL. R	71720	125206	73741	14709	3847	28744	1474	404
WALLA WAL	26500	54179	51945	2884	2573	14986	1039	122
PASCO	17000	52634	38223	3144	2168	6647	764	270
PROSSER	3075	15823	15347	882	830	1535	153	62
DAYTON	3100	8866	8599	259	244	430	86	12
WAITSBURG	1070	2246	2178	167	157	66	22	12
REGION TOTAL	151365	339556	268556	26826	12712	130931	5108	1210
STATE TOTAL	3264268	6432351	2759116	474878	147938	1440504	297862	25295

UNIVERSITY LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
REGION 1								
NO LIBRARIES								
REGION 2								
NO LIBRARIES								
REGION 3								
NO LIBRARIES								
REGION 4								
NO LIBRARIES								
REGION 5								
U OF WASH.	41296	1704698	709144	84352	35090	709144	709144	167
REGION TOTAL	41296	1704698	709144	84352	35090	709144	709144	167
REGION 6								
NO LIBRARIES								
REGION 7								
NO LIBRARIES								
REGION 8								
NO LIBRARIES								
REGION 9								
NO LIBRARIES								
REGION 10								
NO LIBRARIES								

FIGURE F.2, cont.

REGION 11								
WASH. ST.	15656	805330	283052	38045	13371	283052	81264	375
REGION TOTAL	15656	805330	283052	38045	13371	283052	81264	375
REGION 12 NO LIBRARIES								
STATE TOTAL	56952	2510028	992196	122397	48461	992196	790408	542

COLLEGE LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
REGION 1 NO LIBRARIES								
REGION 2 NO LIBRARIES								
REGION 3 NO LIBRARIES								
REGION 4 NO LIBRARIES								
REGION 5 NO LIBRARIES								
REGION 6 NO LIBRARIES								
REGION 7								
W. WASH.	9121	195363	120016	27448	22128	120016	9697	3200
REGION TOTAL	9121	195363	120016	27448	22128	120016	9697	3200
REGION 8								
C. WASH.	9832	159158	110001	17817	12314	110001	4477	625
REGION TOTAL	9832	159158	110001	17817	12314	110001	4477	625
REGION 9 NO LIBRARIES								
REGION 10								
E. WASH.	6223	130479	87368	3552	2378	56300	1748	900
REGION TOTAL	6223	130479	87368	3552	2378	56300	1748	900
REGION 11 NO LIBRARIES								

FIGURE F.2, cont.

REGION 12
NO LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
STATE TOTAL	25176	485000	317385	48817	36820	286317	15922	4725
COM. COLL. LIBRARIES								
REGION 1								
OLYMPIC	4570	30893	21306	2390	2109	13316	426	174
PENINSULA	1043	17500	14583	2022	1692	2084	146	200
REGION TOTAL	5613	48393	35889	4412	3801	15400	572	374
REGION 2								
GRAYS HBR.	2089	29400	20276	3000	2068	2384	406	24
CENTRALIA	1916	20552	14872	2228	1606	744	149	10
REGION TOTAL	4005	49952	35148	5228	3674	3128	555	34
REGION 3								
CLARK	4123	27551	19000	2087	1444	10530	190	10
LOWER COL.	2236	20500	15867	1000	777	4958	159	32
REGION TOTAL	6359	48051	34867	3087	2221	15488	349	42
REGION 4								
TACOMA	3208	40466	23804	6938	4070	6925	866	20
FT STEIL.	1115	10387	8656	4156	3462	1298	87	24
REGION TOTAL	4323	50853	32460	11094	7532	8223	953	44
REGION 5								
SHORELINE	5358	44982	26460	8698	5107	5390	1471	38
HIGHLINE	4764	33500	22333	3000	2010	2218	447	30
SEATTLE	9701	40772	22120	7498	4070	2011	442	10
BELLEVUE	1930	30734	21300	5022	3480	1545	426	20
G. RIVER	4120	25340	17748	4299	3017	1800	177	30
REGION TOTAL	25873	175328	109961	28517	17684	12964	2963	128
REGION 6								
EVERETT	4651	35014	23206	2013	1322	13053	464	28
EDMONDS	1682	12600	10500	1200	998	2940	105	35
REGION TOTAL	6333	47614	33706	3213	2320	15993	569	63
REGION 7								
SKAGIT V.	2684	29935	20644	1959	1342	3443	413	10

FIGURE F.2, cont.

REGION TOTAL	2684	29935	20644	1959	1342	3443	413	10
REGION 8								
YAKIMA V.	3320	24493	20382	2175	1814	2397	408	100
REGION TOTAL	3320	24493	20382	2175	1814	2397	408	100
REGION 9								
WENAT. V.	1783	28180	19434	3919	2701	10970	194	150
BIG BEND	1177	19111	14792	3821	2958	6452	148	100
REGION TOTAL	2960	47291	34226	7740	5659	17422	342	250
REGION 10								
SPOKANE	4615	41268	22392	4800	2597	13724	448	30
REGION TOTAL	4615	41268	22392	4800	2597	13724	448	30
REGION 11 NO LIBRARIES								
REGION 12								
COL. BASIN	2855	20923	16194	2300	1781	10306	162	80
WALLA WAL.	1380	16231	12563	8009	6193	5025	126	20
REGION TOTAL	4235	37154	28757	10309	7974	15331	288	100
STATE TOTAL	70320	600332	408432	82534	56618	123513	7860	1175

STATE LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
REGION 1 NO LIBRARIES								
REGION 2								
WASH.S.L.	0	208914	146070	14727	9732	146070	16813	900
REGION TOTAL	0	208914	146070	14727	9732	146070	16813	900
REGION 3 NO LIBRARIES								
REGION 4 NO LIBRARIES								
REGION 5 NO LIBRARIES								
REGION 6 NO LIBRARIES								

FIGURE F.2, cont.

REGION
NO LIBRARIES

REGION 8
NO LIBRARIES

REGION 9
NO LIBRARIES

REGION 10
NO LIBRARIES

REGION 11
NO LIBRARIES

REGION 12
NO LIBRARIES

STATE TOTAL	0	208914	146070	14727	9732	146070	16813	900

ALL LIBRARIES

	PATRONS SERVED	VOLUMES	TITLES	VOLUMES ACQUIRED	TITLES ACQUIRED	REGIONAL TITLES	STATE TITLES	VOLUMES BORROWED
REGION 1	147338	327153	189309	25029	13453	118317	3441	1663
REGION 2	222872	707313	329118	48328	20744	211179	22012	3529
REGION 3	188101	422804	222138	20065	11560	113080	3799	1569
REGION 4	386897	778232	290071	63345	24692	188982	11745	2044
REGION 5	1182634	4136066	1399023	310628	81444	959164	928280	6912
REGION 6	289150	397551	229593	33383	15535	162108	5366	2393
REGION 7	126485	560397	397234	46720	35807	200644	14364	4264
REGION 8	190597	502592	303594	36834	23923	184292	10568	2139
REGION 9	135176	347929	129315	29685	9076	98835	2199	2317
REGION 10	323461	747515	442513	46723	23104	277483	38345	3425
REGION 11	68405	932363	393978	45478	19545	328254	83350	1072
REGION 12	155600	376710	297313	37135	20686	146262	5396	1310
STATE TOTAL	3416716	10236625	4623199	743353	299569	2988600	1128865	32637

FIGURE F.2, cont.

Values of p_i are shown in Chapter 2, Table 2.6. Cost of lending is estimated to be $1.50 per volume and is assumed to be the same for all types of libraries.

For the regional network loans of each library are the sum of loans made within the region and loans made to libraries outside the region. Loans made within the region by each library are calculated

by NLOANSR = NTRVLBR(K) x RGPRCNT x (RLIBUNQ/REGNUNQ)

where NLOANSR = number of loans made by a library to other libraries within the region

K = region number

NTRVLBR(K) = number of total volumes borrowed by libraries in region K

RGPRCNT = percent of borrowings by libraries within region K that can be obtained within the region

RLIBUNQ = regional unique titles of lending library

REGNUNQ = total unique titles in all libraries in region K

and RGPRCNT = REGNUNQ/STATUNQ

where STATUNQ = total unique titles in all libraries in state

Loans made to libraries in each region outside the one in which the lending library is located are calculated as follows and summed for all regions.

NLOANSS = NTRVLBR(L) x (1. - RGPRCNT) x (SLIBUNQ/(STATUNQ - SREGUNQ))

where NLOANSS = number of loans made by library to libraries in other regions

L = region to which loans are made

NTRVLBR(L) = number of volumes borrowed by libraries in region L

RGPRCNT = percent of borrowings by libraries within region L that can be obtained within region

SLIBUNQ = statewide unique titles of lending library

STATUNQ = total unique titles in all libraries in state

SREGUNQ = contribution of libraries in region L to total unique titles in all libraries in state

and RGPRCNT is computed as previously. Cost of lending to libraries both within the region and outside the region is estimated to be $1.50 per volume and is assumed to be the same for all types of libraries.

For the state-wide network loans of each library are computed as follows

NLOANSX = NTSVLBR x (SLIBUNQ/STATUNQ)

where NLOANSX = number of loans made by a library to other libraries in the state

NTSVLBR = total number of volumes borrowed in the state

SLIBUNQ = state-wide unique titles of lending library

STATUNQ = total unique titles in all libraries in state

Cost of lending is estimated to be $1.50 per volume regardless of type of library.

F.4 Subroutine TECHSER

TECHSER calculates the quantity and costs of processing volumes and titles for the present system, a regional network, and a statewide network. Total costs for each library are the sum of costs of processing volumes acquired and titles acquired. The number of volumes acquired and number of titles acquired is input data for each library.

Volume processing costs are estimated to be $.60 per volume and are assumed to be the same for all libraries. The number of volumes acquired and cost of processing these volumes is the same for all three systems.

For the present system the number of titles processed by each library is the number of titles acquired. Cost of processing is estimated to be $5.00 per title and is the same for all libraries.

In the regional network it is assumed that libraries within the region share cataloging of titles within the region. Costs to a library of processing a title are estimated to be $2.00 per title plus a prorated share of cataloging costs in the region of $3.00 per title. For each library the total cost of processing titles is calculated

by KTITPRC = NTITACQ(I,J) x 2.00 + (NTITACQ(I,J) x (REGNUNQ/REGNTIT) x 3.00)

where KTITPRC = cost to a library of processing titles acquired

I = library number

J = library type

NTITACQ(I,J) = number of titles acquired by library I,J

REGNUNQ = number of unique titles in region

REGNTIT = total number of titles in all libraries in region

In effect, the term (REGNUNQ/REGNTIT) is the average amount of cataloging that must be done for each title acquired by a library in the region when cataloging is shared by all libraries in the region.

In the state-wide network it is assumed that libraries share cataloging throughout the state. Costs to a library of processing a title are estimated to $2.00 per title plus a prorated share of cataloging costs in the state of $3.00 per title. For each library the total cost of processing titles is calculated

by KTITPRC = NTITACQ(I,J) x 2.00 + (NTITACQ(I,J) x (STATUNQ/STATTIT) x 3.00)

where KTITPRC = cost to a library of processing titles acquired

I = library number

J = library type

NTITACQ(I,J) = number of titles acquired by library I,J

STATUNQ = number of unique titles in state

STATTIT = total number of titles in all libraries in state

The term (STATUNQ/STATTIT) is the average amount of cataloging that must be done for each title acquired by a library when cataloging is shared by all libraries in the state.

F.5 Subroutine COLMGMT

COLMGMT calculates the number and cost of maintaining low circulation volumes for the present system, a regional network, and a state-wide network. Because of the lack of data and absence of theoretical development of concepts of collection management, this subroutine is the least well developed of the three cost calculation subroutines.

Low circulation volumes for the present system are estimated

by NLCVOLM = NTITLES(I,J) x .50

where NLCVOLM = number of low circulation volumes maintained

I = library number

J = library type

NTITLES(I,J) = number of titles in library I,J

For the regional network, low circulation volumes maintained in the system are estimated

by NLCVOLM = NRUNQTI(I,J) x .50

where NLCVOLM = number of low circulation volumes maintained

I = library number

J = library type

NRUNQTI(I,J) = regional unique titles of library I,J

This calculation is based on the assumption that low circulation volumes will be maintained at only one library in the region and that low circulation volumes are approximately 50% of the titles in the region.

For the state-wide network low circulation volumes maintained in the system are estimated

by NLCVOLM = NSUNQTI(I.J) x .50

where NLCVOLM = number of low circulation volumes maintained

I = library number

J = library type

NSUNQTI(I,J) = state-wide unique titles of library I,J

This calculation is based on the assumption that low circulation volumes will be maintained at only one library in the state and that low circulation volumes are approximately 50% of the titles in the state.

Cost of maintaining low circulation volumes is estimated to be $.20 per volume per year regardless of library type. The cost per volume is assumed to be the same for all three systems.

F.6 Program Variables

The following is a listing of all program variables and their meaning. Throughout the program the subscripts I, J and K have been used consistently with I referring to library number (numbered in sequence within type), J referring to type, and K referring to region. The subscript L is used for region in place of K in one instance.

BOROWS	-number of volumes borrowed by library
IREGION(I,J)	-region number of library
KBOROWS	-cost of volumes borrowed by library
KILLONS	-cost of interlibrary loan activity of library
KLCVOLM	-cost of low circulation volumes maintained by library
KLOANSX	-cost of volumes loaned by library
KPRILLN	-cost of interlibrary loan activity for present system for one region
KPRILLS(J,K)	-cost of interlibrary loan activity for present system
KPRLCVL(J,K)	-cost of low circulation volumes maintained for present system
KPRLWCV	-cost of low circulation volumes maintained for present system for one region

KPROCSS	-cost of technical services for library
KPRPRCS(J,K)	-cost of technical services for present system
KPRPROC	-cost of technical services for present system for one region
KPSILLS	-cost of interlibrary loan activity for present system for one library type
KPSLCVL	-cost of low circulation volumes maintained for present system for one library type
KPSPRCS	-cost of technical services for present system for one library type
KPSTILL	-total cost of interlibrary loan activity for present system
KPSTLCV	-total cost of low circulation volumes maintained for present system
KPSTPRC	-total cost of technical services activity for present system
KRBORWS	-cost of volumes borrowed in region for one library type
KRLOANS	-cost of volumes loaned in region for one library type
KRRILLN	-cost of interlibrary loan activity for regional network for one region
KRRILLS(J,K)	-cost of interlibrary loan activity for regional network
KRRLCVL(J,K)	-cost of regional network low circulation volumes maintained
KRRLWCV	-cost of low circulation volumes maintained for regional network for one region
KRRPRCS(J,K)	-cost of technical services for regional network
KRRPROC	-cost of technical services for regional network for one region

KRSILLS -cost of interlibrary loan activity for regional network for one library type

KRSLCVL -cost of low circulation volumes maintained for regional network for one library type

KRSPRCS -cost of technical services for regional network for one library type

KRSTILL -total cost of interlibrary loan activity for regional network

KRSTLCV -total cost of low circulation volumes maintained for regional network

KRSTPRC -total cost of technical services for regional network

KRTITPR -cost of titles processed in region by one library type

KRVOLPR -cost of volumes processed in region by one library type

KSBORWS -cost of volumes borrowed in state by one library type

KSILLNS -cost of interlibrary loan activity in state by one library type

KSLCVOL -cost of low circulation volumes maintained in state by one library type

KSLOANS -cost of volumes loaned in state by one library type

KSPROCS -cost of technical services in state for one library type

KSRILLN -cost of interlibrary loan activity for state-wide network for one region

KSRILLS(J,K) -cost of interlibrary loan activity for state-wide network

KSRLCVL(J,K) -cost of low circulation volumes maintained for statewide network

KSRLWCV	-cost of low circulation volumes maintained for state-wide network for one region
KSRPRCS(J,K)	-cost of technical services for state-wide network
KSRPROC	-cost of technical services for state-wide network for one region
KSSILLS	-cost of interlibrary loan activity for state-wide network for one library type
KSSLCVL	-cost of low circulation volumes maintained for state-wide network for one library type
KSSPRCS	-cost of technical services for state-wide network for one library type
KSSTILL	-total cost of interlibrary loan activity for state-wide network
KSSTLCV	-total cost of low circulation volumes maintained for state-wide network
KSSTPRC	-total cost of technical services for state-wide network
KSTITPR	-cost of titles processed in state for one library type
KSVOLPR	-cost of volumes processed in state for one library type
KTITPRC	-cost of processing titles acquired by one library
KVOLPRC	-cost of processing volumes acquired by one library
LIBRAR	-library name
LIBRARY(I,J)	-library name
LIBTYPE(J)	-type name
NBOROWS(I,J)	-number of volumes borrowed by library
NLBTYPE(J)	-number of libraries of one type

NLCVOLM	-number of low circulation volumes maintained by a library
NLIBRAR	-number of libraries in input data
NLOANSR	-number of volumes loaned within region by a library
NLOANSS	-number of volumes loaned outside region by one library
NLOANSX	-number of volumes loaned by a library
NPRINTS	-number of libraries printed under regional heading (0 if none, 1 if one or more)
NRBOROWS	-number of volumes borrowed in region by one library type
NRGIONS	-number of regions
NRLCVOL	-number of low circulation volumes maintained in region by one library type
NRLOANS	-number of volumes loaned in region by one library type
NRRUNQT	-number of regional unique titles in region for one library type
NRSERVD	-number of patrons served in region by one library type
NRSUNQT	-number of state-wide unique titles in region for one library type
NRTITAQ	-number of titles acquired in region for one library type (sum of titles acquired by individual libraries without regard for duplication)
NRTITLS	-number of titles in region for one library type (sum of titles in individual libraries without regard for duplication)
NRUNQTI(I,J)	-number of unique titles in library on regional basis

NRVOLAQ	-number of volumes acquired in region by one library type
NRVOLBR	-number of volumes borrowed in region by one library type
NRVOLMS	-number of volumes in region for one library type
NSBORWS	-number of volumes borrowed in state by one library type
NSERVED(I,J)	-patrons served by library
NSLCVOL	-number of low circulation volumes maintained in state by one library type
NSLOANS	-number of volumes loaned in state by one library type
NSRUNQT	-number of regional unique titles in state for one library type (sum of titles in individual libraries without regard for duplication)
NSSERVD	-number of patrons served in state by one library type
NSSUNQT	-number of unique titles in state for one library type
NSTITAQ	-number of titles acquired in state by one library type (sum of titles acquired by individual libraries without regard for duplication)
NSTITLS	-number of titles in state for one library type (sum of titles in individual libraries without regard for duplication)
NSUNQTI(I,J)	-number of unique titles in library on state-wide basis
NSVOLAQ	-number of volumes acquired in state for one library type
NSVOLBR	-number of volumes borrowed in state by one library type

NSVOLMS	-number of volumes in state for one library type
NTITACQ(I,J)	-number of titles acquired by library
NTITLES(I,J)	-number of titles in library
NTRRUQT(K)	-total unique titles in region
NTRSERV(K)	-total patrons served in region
NTRSUQT(K)	-total unique titles contributed by region to state-wide unique titles
NTRTITA(K)	-total titles acquired in region (sum of titles acquired without regard for duplication)
NTRTITS(K)	-total titles in region (sum of titles in individual libraries without regard for duplication)
NTRVLBR(K)	-total volumes borrowed by libraries in region
NTRVOLA(K)	-total volumes acquired in region
NTRVOLS(K)	-total volumes in region
NTSRUQT	-total regional unique titles in state (sum of titles in individual regions without regard for duplication)
NTSSERV	-total patrons served by libraries in state
NTSSUQT	-total unique titles in state
NTSTITA	-total titles acquired in state (sum of titles acquired by individual libraries without regard for duplication)
NTSTITS	-total titles in state (sum of titles in individual libraries in state without regard for duplication)
NTSVLBR	-total volumes borrowed in state
NTSVOLS	-total volumes in state

NTSVOLA	-total volumes acquired in state
NTYPSLB	-number of types of libraries
NUMLIBS	-number of libraries of one type
NVOLACQ(I,J)	-number of volumes acquired by library
NVOLUMS(I,J)	-number of volumes in library
REGION	-region number of library
REGNTIT	-total titles in region (sum of titles in individual libraries without regard for duplication)
REGNUNQ	-total unique titles in region
RGPRCNT	-regional percent
RLIBUNQ	-number of unique titles in library on regional basis
RUNQTI	-number of unique titles in library on regional basis
SERVED	-patrons served by library
SLIBUNQ	-number of unique titles in library on state-wide basis
SREGUNQ	-total unique titles contributed by region to state-wide unique titles
STATTIT	-total titles in state (sum of titles in individual libraries without regard for duplication)
STATUNQ	-total unique titles in state
SUNQTI	-number of unique titles in library on state-wide basis
TITACQ	-number of titles acquired by library
TITLES	-number of titles in library
TYPELB	-type of library
VOLACQ	-number of volumes acquired by library
VOLUMS	-number of volumes in library

```
PROGRAM NETWORK(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
COMMON LIBRARY(100,5),NRUNQTI(100,5),NSUNQTI(100,5)
COMMON IREGION(100,5),NSERVED(100,5),NVOLUMS(100,5)
COMMON NTITLES(100,5),NVOLACQ(100,5),NTITACQ(100,5)
COMMON NBOROWS(100,5)
COMMON LIBTYPE(5),NLBTYPE(5)
COMMON NRGIONS,NTYPSLB
COMMON NTRSERV(15),NTRVOLS(15),NTRTITS(15),NTRVOLA(15)
COMMON NTRTITA(15),NTRRUQT(15),NTRSUQT(15),NTRVLBR(15)
COMMON NTSSERV,NTSVOLS,NTSTITS,NTSVOLA
COMMON NTSTITA,NTSRUQT,NTSSUQT,NTSVLBR
COMMON KPRILLS(5,15),KRRILLS(5,15),KSRILLS(5,15)
COMMON KPRPRCS(5,15),KRRPRCS(5,15),KSRPRCS(5,15)
COMMON KPRLCVL(5,15),KRRLCVL(5,15),KSRLCVL(5,15)
CALL INPUT
CALL INTLOAN
CALL TECHSER
CALL COLMGMT
STOP
END
```

FIGURE F.3

ALTERNATE LIBRARY SYSTEM CONFIGURATIONS - PROGRAM LISTING

FIGURE F.3

```
      SUBROUTINE INPUT
      COMMON LIBRARY(100,5),NRUNQTI(100,5),NSUNQTI(100,5)
      COMMON IREGION(100,5),NSERVED(100,5),NVOLUMS(100,5)
      COMMON NTITLES(100,5),NVOLACQ(100,5),NTITACQ(100,5)
      COMMON NBOROWS(100,5)
      COMMON LIBTYPE(5),NLBTYPE(5)
      COMMON NRGIONS,NTYPSLB
      COMMON NTRSERV(15),NTRVOLS(15),NTRTITS(15),NTRVOLA(15)
      COMMON NTRTITA(15),NTRRUQT(15),NTRSUQT(15),NTRVLBR(15)
      COMMON NTSSERV,NTSVOLS,NTSTITS,NTSVOLA
      COMMON NTSTITA,NTSRUQT,NTSSUQT,NTSVLBR
      COMMON KPRILLS(5,15),KRRILLS(5,15),KSRILLS(5,15)
      COMMON KPRPRCS(5,15),KRRPRCS(5,15),KSRPRCS(5,15)
      COMMON KPRLCVL(5,15),KRRLCVL(5,15),KSRLCVL(5,15)
 1000 FORMAT(A10,2F3.0,7F9.0)
 1001 FORMAT(16X,F9.0)
 1010 FORMAT(1H1,14HRUN INPUT DATA,///)
 1020 FORMAT(1H ,40X,10H   PATRONS,20X,10H   VOLUMES,10H    TITLES,
    X10H  REGIONAL,10H     STATE,10H   VOLUMES)
 1025 FORMAT(1H ,20X,10H   PATRONS,20X,10H   VOLUMES,10H    TITLES,
    X10H  REGIONAL,10H     STATE,10H   VOLUMES)
 1030 FORMAT(1H ,10X,10HLIBRARY   ,10H      TYPE,10H    REGION,
    X10H    SERVED,10H   VOLUMES,10H    TITLES,10H  ACQUIRED,
    X10H  ACQUIRED,10H    TITLES,10H    TITLES,10H  BORROWED,/)
 1035 FORMAT(1H ,20X,10H    SERVED,10H   VOLUMES,10H    TITLES,
    X10H  ACQUIRED,10H  ACQUIRED,10H    TITLES,10H    TITLES,
    X10H  BORROWED,/)
 1040 FORMAT(1H ,A10,10X,10F10.0)
 1045 FORMAT(1H0,7X,11HSTATE TOTAL,22X,8I10,//)
 1050 FORMAT(1H0,35HTOTAL NUMBER OF LIBRARIES IN RUN - ,I3)
 1060 FORMAT(1H ,33HTOTAL NUMBER OF REGIONS IN RUN - ,I2)
 1070 FORMAT(1H1,10HSTATISTICS,///)
 1080 FORMAT(1H ,A10,10H LIBRARIES,//)
 1090 FORMAT(1H ,10H    REGION,I3,/)
 1100 FORMAT(1H ,10X,A10,8I10)
 1110 FORMAT(1H+,7X,12HNO LIBRARIES,/)
 1120 FORMAT(1H0,7X,12HREGION TOTAL,1X,8I10,/)
 1130 FORMAT(1H0,7X,11HSTATE TOTAL,2X,8I10,//////)
 1140 FORMAT(1H ,13HALL LIBRARIES,//)
 1150 FORMAT(1H ,10H    REGION,I3,7X,8I10)
 1160 FORMAT(1H0,7X,11HSTATE TOTAL,2X,8I10)
C
C      PRINT OUT INPUT DATA
C
      WRITE(6,1010)
      WRITE(6,1020)
      WRITE(6,1030)
   10 NLIBRAR=NLIBRAR+1
      READ(5,1000)LIBRAR,TYPELB,REGION,SERVED,VOLUMS,TITLES,VOLACQ,
     X            TITACQ,RUNQTI,SUNQTI
      IF(VOLUMS.EQ.0) GO TO 20
      READ(5,1001)BOROWS
      WRITE(6,1040)LIBRAR,TYPELB,REGION,SERVED,VOLUMS,TITLES,VOLACQ,
     X            TITACQ,RUNQTI,SUNQTI,BOROWS
      IF(REGION.GT.NRGIONS) NRGIONS=REGION
      IF(TYPELB.GT.NTYPSLB) NTYPSLB=TYPELB
```

FIGURE F.3

```
      J=TYPELB
      NLBTYPE(J)=NLBTYPE(J)+1
      I=NLBTYPE(J)
      LIBRARY(I,J)=LIBRAR
      IREGION(I,J)=REGION
      NSERVED(I,J)=SERVED
      NVOLUMS(I,J)=VOLUMS
      NTITLES(I,J)=TITLES
      NVOLACQ(I,J)=VOLACQ
      NTITACQ(I,J)=TITACQ
      NRUNQTI(I,J)=RUNQTI
      NSUNQTI(I,J)=SUNQTI
      NBOROWS(I,J)=BOROWS
      NTSSERV=NTSSERV+SERVED
      NTSVOLS=NTSVOLS+VOLUMS
      NTSTITS=NTSTITS+TITLES
      NTSVOLA=NTSVOLA+VOLACQ
      NTSTITA=NTSTITA+TITACQ
      NTSRUQT=NTSRUQT+RUNQTI
      NTSSUQT=NTSSUQT+SUNQTI
      NTSVLBR=NTSVLBR+BOROWS
      GO TO 10
   20 NLIBRAR=NLIBRAR-1
      WRITE(6,1045)NTSSERV,NTSVOLS,NTSTITS,NTSVOLA,NTSTITA,NTSRUQT,
     X             NTSSUQT,NTSVLBR
      WRITE(6,1050)NLIBRAR
      WRITE(6,1060)NRGIONS
      DO 30 J=1,NTYPSLB
      READ(5,1000)LIBTYPE(J)
   30 CONTINUE
      WRITE(6,1070)
      DO 60 J=1,NTYPSLB
      WRITE(6,1080)LIBTYPE(J)
      WRITE(6,1025)
      WRITE(6,1035)
      NUMLIBS=NLBTYPE(J)
      NSSERVD=0
      NSVOLMS=0
      NSTITLS=0
      NSVOLAQ=0
      NSTITAQ=0
      NSRUNQT=0
      NSSUNQT=0
      NSVOLBR=0
      DO 50 K=1,NRGIONS
      WRITE(6,1090)K
      NRSERVD=0
      NRVOLMS=0
      NRTITLS=0
      NRVOLAQ=0
      NRTITAQ=0
      NRRUNQT=0
      NRSUNQT=0
      NRVOLBR=0
      DO 40 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 40
```

FIGURE F.3

```
   NSSERVD=NSSERVD+NSERVED(I,J)
   NRSERVD=NRSERVD+NSERVED(I,J)
   NSVOLMS=NSVOLMS+NVOLUMS(I,J)
   NRVOLMS=NRVOLMS+NVOLUMS(I,J)
   NSTITLS=NSTITLS+NTITLES(I,J)
   NRTITLS=NRTITLS+NTITLES(I,J)
   NSVOLAQ=NSVOLAQ+NVOLACQ(I,J)
   NRVOLAQ=NRVOLAQ+NVOLACQ(I,J)
   NSTITAQ=NSTITAQ+NTITACQ(I,J)
   NRTITAQ=NRTITAQ+NTITACQ(I,J)
   NSRUNQT=NSRUNQT+NRUNQTI(I,J)
   NRRUNQT=NRRUNQT+NRUNQTI(I,J)
   NSSUNQT=NSSUNQT+NSUNQTI(I,J)
   NRSUNQT=NRSUNQT+NSUNQTI(I,J)
   NSVOLBR=NSVOLBR+NBOROWS(I,J)
   NRVOLBR=NRVOLBR+NBOROWS(I,J)
   WRITE(6,1100)LIBRARY(I,J),NSERVED(I,J),NVOLUMS(I,J),NTITLES(I,J),
  X             NVOLACQ(I,J),NTITACQ(I,J),NRUNQTI(I,J),NSUNQTI(I,J),
  X             NBOROWS(I,J)
40 CONTINUE
   IF(NRVOLMS.EQ.0) GO TO 45
   WRITE(6,1120)NRSERVD,NRVOLMS,NRTITLS,NRVOLAQ,NRTITAQ,NRRUNQT,
  X             NRSUNQT,NRVOLBR
   NTRSERV(K)=NTRSERV(K)+NRSERVD
   NTRVOLS(K)=NTRVOLS(K)+NRVOLMS
   NTRTITS(K)=NTRTITS(K)+NRTITLS
   NTRVOLA(K)=NTRVOLA(K)+NRVOLAQ
   NTRTITA(K)=NTRTITA(K)+NRTITAQ
   NTRRUQT(K)=NTRRUQT(K)+NRRUNQT
   NTRSUQT(K)=NTRSUQT(K)+NRSUNQT
   NTRVLBR(K)=NTRVLBR(K)+NRVOLBR
   GO TO 50
45 WRITE(6,1110)
50 CONTINUE
   WRITE(6,1130)NSSERVD,NSVOLMS,NSTITLS,NSVOLAQ,NSTITAQ,NSRUNQT,
  X             NSSUNQT,NSVOLBR
60 CONTINUE
   WRITE(6,1140)
   WRITE(6,1025)
   WRITE(6,1035)
   DO 70 K=1,NRGIONS
   WRITE(6,1150)K,NTRSERV(K),NTRVOLS(K),NTRTITS(K),NTRVOLA(K),
  X             NTRTITA(K),NTRRUQT(K),NTRSUQT(K),NTRVLBR(K)
70 CONTINUE
   WRITE(6,1160)NTSSERV,NTSVOLS,NTSTITS,NTSVOLA,NTSTITA,NTSRUQT,
  X             NTSSUQT,NTSVLBR
   RETURN
   END
```

FIGURE F.3

```
      SUBROUTINE INTLOAN
      COMMON LIBRARY(100,5),NRUNQTI(100,5),NSUNQTI(100,5)
      COMMON IREGION(100,5),NSERVED(100,5),NVOLUMS(100,5)
      COMMON NTITLES(100,5),NVOLACQ(100,5),NTITACQ(100,5)
      COMMON NBOROWS(100,5)
      COMMON LIBTYPE(5),NLBTYPE(5)
      COMMON NRGIONS,NTYPSLB
      COMMON NTRSERV(15),NTRVOLS(15),NTRTITS(15),NTRVOLA(15)
      COMMON NTRTITA(15),NTRRUQT(15),NTRSUQT(15),NTRVLBR(15)
      COMMON NTSSERV,NTSVOLS,NTSTITS,NTSVOLA
      COMMON NTSTITA,NTSRUQT,NTSSUQT,NTSVLBR
      COMMON KPRILLS(5,15),KRRILLS(5,15),KSRILLS(5,15)
      COMMON KPRPRCS(5,15),KRRPRCS(5,15),KSRPRCS(5,15)
      COMMON KPRLCVL(5,15),KRRLCVL(5,15),KSRLCVL(5,15)
 1000 FORMAT(1H1,34HPRESENT SYSTEM INTER-LIBRARY LOANS,///)
 1010 FORMAT(1H ,A10,10H LIBRARIES,//)
 1015 FORMAT(1H ,60X,10H     TOTAL)
 1020 FORMAT(1H ,20X,10HBORROWINGS,10H      COST,10H     LOANS,
     X10H      COST,10H      COST,/)
 1030 FORMAT(1H ,10H    REGION,I3,/)
 1040 FORMAT(1H ,10X,A10,5I10)
 1050 FORMAT(1H0,7X,12HREGION TOTAL,1X,5I10,/)
 1060 FORMAT(1H+,7X,12HNO LIBRARIES,/)
 1070 FORMAT(1H0,7X,11HSTATE TOTAL,2X,5I10,//////)
 1075 FORMAT(1H0,7X,11HSTATE TOTAL,2X,3I10,//////)
 1100 FORMAT(1H1,36HREGIONAL NETWORK INTER-LIBRARY LOANS,///)
 1200 FORMAT(1H1,37HSTATEWIDE NETWORK INTER-LIBRARY LOANS,///)
 1300 FORMAT(1H1,35HINTER-LIBRARY LOANS FOR ALL SYSTEMS,///)
 1310 FORMAT(1H ,30X,10H  REGIONAL,10H STATEWIDE)
 1320 FORMAT(1H ,20X,10H   PRESENT,10H   NETWORK,10H   NETWORK)
 1330 FORMAT(1H ,20X,10H      COST,10H      COST,10H      COST,/)
 1340 FORMAT(1H ,10H    REGION,I3,7X,3I10)
 1350 FORMAT(1H ,13HALL LIBRARIES,//)
C
C     CALCULATE PRESENT SYSTEM INTER-LIBRARY LOANS
C
      WRITE(6,1000)
      DO 60 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSBORWS=0
      KSBORWS=0
      NSLOANS=0
      KSLOANS=0
      KSILLNS=0
      DO 50 K=1,NRGIONS
      WRITE(6,1030)K
      NRBORWS=0
      KRBORWS=0
      NRLOANS=0
      KRLOANS=0
      NPRINTS=0
      DO 40 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 40
```

FIGURE F.3

```
      NRBORWS=NRBORWS+NBOROWS(I,J)
      NSBORWS=NSBORWS+NBOROWS(I,J)
      KBOROWS=NBOROWS(I,J)*4.50
      KRBORWS=KRBORWS+KBOROWS
      KSBORWS=KSBORWS+KBOROWS
      NLOANSX=0
      IF(LIBRARY(I,J).EQ.10HWASH.S.L. ) NLOANSX=NTSVLBR*.63
      IF(LIBRARY(I,J).EQ.10HSEATTLE P.) NLOANSX=NTSVLBR*.13
      IF(LIBRARY(I,J).EQ.10HU OF WASH.) NLOANSX=NTSVLBR*.10
      IF(LIBRARY(I,J).EQ.10HEVERETT P.) NLOANSX=NTSVLBR*.04
      IF(LIBRARY(I,J).EQ.10HTACOMA P. ) NLOANSX=NTSVLBR*.04
      IF(LIBRARY(I,J).EQ.10HSPOKANE P.) NLOANSX=NTSVLBR*.02
      IF(LIBRARY(I,J).EQ.10HWASH. ST. ) NLOANSX=NTSVLBR*.02
      IF(LIBRARY(I,J).EQ.10HTIMBER. R.) NLOANSX=NTSVLBR*.02
      NRLOANS=NRLOANS+NLOANSX
      NSLOANS=NSLOANS+NLOANSX
      KLOANSX=NLOANSX*1.50
      KRLOANS=KRLOANS+KLOANSX
      KSLOANS=KSLOANS+KLOANSX
      KILLONS=KBOROWS+KLOANSX
      KPRILLS(J,K)=KPRILLS(J,K)+KILLONS
      KSILLNS=KSILLNS+KILLONS
      WRITE(6,1040)LIBRARY(I,J),NBOROWS(I,J),KBOROWS,NLOANSX,KLOANSX,
     XKILLONS
      NPRINTS=1
   40 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 45
      WRITE(6,1050)NRBORWS,KRBORWS,NRLOANS,KRLOANS,KPRILLS(J,K)
      GO TO 50
   45 WRITE(6,1060)
   50 CONTINUE
      WRITE(6,1070)NSBORWS,KSBORWS,NSLOANS,KSLOANS,KSILLNS
   60 CONTINUE
C
C     CALCULATE REGIONAL NETWORK INTER-LIBRARY LOANS
C
      WRITE(6,1100)
      DO 120 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSBORWS=0
      KSBORWS=0
      NSLOANS=0
      KSLOANS=0
      KSILLNS=0
      DO 110 K=1,NRGIONS
      WRITE(6,1030)K
      NRBORWS=0
      KRBORWS=0
      NRLOANS=0
      KRLOANS=0
      NPRINTS=0
      REGNUNQ=NTRRUQT(K)
      STATUNQ=NTSSUQT
```

FIGURE F.3

```
      RGPRCNT=REGNUNQ/STATUNQ
      DO 100 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 100
      NRBORWS=NRBORWS+NBOROWS(I,J)
      NSBORWS=NSBORWS+NBOROWS(I,J)
      KBOROWS=NBOROWS(I,J)*4.50
      KRBORWS=KRBORWS+KBOROWS
      KSBORWS=KSBORWS+KBOROWS
      RLIBUNQ=NRUNQTI(I,J)
      IF(REGNUNQ.EQ.0) REGNUNQ=.00001
      NLOANSR=NTRVLBR(K)*RGPRCNT*(RLIBUNQ/REGNUNQ)
      NLOANSS=0
      SLIBUNQ=NSUNQTI(I,J)
      DO 95 L=1,NRGIONS
      IF(L.EQ.K) GO TO 95
      REGNUNQ=NTRRUQT(L)
      RGPRCNT=REGNUNQ/STATUNQ
      SREGUNQ=NTRSUQT(L)
      NLOANSS=NLOANSS+(NTRVLBR(L)*(1.-RGPRCNT)
     X*(SLIBUNQ/(STATUNQ-SREGUNQ)))
   95 CONTINUE
      NLOANSX=NLOANSR+NLOANSS
      NRLOANS=NRLOANS+NLOANSX
      NSLOANS=NSLOANS+NLOANSX
      KLOANSX=NLOANSX*1.50
      KRLOANS=KRLOANS+KLOANSX
      KSLOANS=KSLOANS+KLOANSX
      KILLONS=KBOROWS+KLOANSX
      KRRILLS(J,K)=KRRILLS(J,K)+KILLONS
      KSILLNS=KSILLNS+KILLONS
      WRITE(6,1040)LIBRARY(I,J),NBOROWS(I,J),KBOROWS,NLOANSX,KLOANSX,
     XKILLONS
      NPRINTS=1
  100 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 105
      WRITE(6,1050)NRBORWS,KRBORWS,NRLOANS,KRLOANS,KRRILLS(J,K)
      GO TO 110
  105 WRITE(6,1060)
  110 CONTINUE
      WRITE(6,1070)NSBORWS,KSBORWS,NSLOANS,KSLOANS,KSILLNS
  120 CONTINUE
C
C     CALCULATE STATEWIDE NETWORK INTER-LIBRARY LOANS
C
      WRITE(6,1200)
      DO 160 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSBORWS=0
      KSBORWS=0
      NSLOANS=0
      KSLOANS=0
      KSILLNS=0
      DO 150 K=1,NRGIONS
```

FIGURE F.3

```
      WRITE(6,1030)K
      NRBORWS=0
      KRBORWS=0
      NRLOANS=0
      KRLOANS=0
      NPRINTS=0
      DO 140 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 140
      NRBORWS=NRBORWS+NBOROWS(I,J)
      NSBORWS=NSBORWS+NBOROWS(I,J)
      KBOROWS=NBOROWS(I,J)*4.50
      KRBORWS=KRBORWS+KBOROWS
      KSBORWS=KSBORWS+KBOROWS
      SLIBUNQ=NSUNQTI(I,J)
      STATUNQ=NTSSUQT
      NLOANSX=NTSVLBR*(SLIBUNQ/STATUNQ)
      NRLOANS=NRLOANS+NLOANSX
      NSLOANS=NSLOANS+NLOANSX
      KLOANSX=NLOANSX*1.50
      KRLOANS=KRLOANS+KLOANSX
      KSLOANS=KSLOANS+KLOANSX
      KILLONS=KBOROWS+KLOANSX
      KSRILLS(J,K)=KSRILLS(J,K)+KILLONS
      KSILLNS=KSILLNS+KILLONS
      WRITE(6,1040)LIBRARY(I,J),NBOROWS(I,J),KBOROWS,NLOANSX,KLOANSX,
     XKILLONS
      NPRINTS=1
  140 CONTINUE
      IF(NPRINTS=EQ.0) GO TO 145
      WRITE(6,1050)NRBORWS,KRBORWS,NRLOANS,KRLOANS,KSRILLS(J,K)
      GO TO 150
  145 WRITE(6,1060)
  150 CONTINUE
      WRITE(6,1070)NSBORWS,KSBORWS,NSLOANS,KSLOANS,KSILLNS
  160 CONTINUE
C
C     SUMMARIZE INTER-LIBRARY LOANS FOR ALL SYSTEMS
C
      WRITE(6,1300)
      DO 180 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      KPSILLS=0
      KRSILLS=0
      KSSILLS=0
      DO 170 K=1,NRGIONS
      WRITE(6,1340)K,KPRILLS(J,K),KRRILLS(J,K),KSRILLS(J,K)
      KPSILLS=KPSILLS+KPRILLS(J,K)
      KRSILLS=KRSILLS+KRRILLS(J,K)
      KSSILLS=KSSILLS+KSRILLS(J,K)
  170 CONTINUE
      WRITE(6,1075)KPSILLS,KRSILLS,KSSILLS
  180 CONTINUE
      WRITE(6,1350)
```

FIGURE F.3

```
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      DO 200 K=1,NRGIONS
      KPRILLN=0
      KRRILLN=0
      KSRILLN=0
      DO 190 J=1,NTYPSLB
      KPRILLN=KPRILLN+KPRILLS(J,K)
      KRRILLN=KRRILLN+KRRILLS(J,K)
      KSRILLN=KSRILLN+KSRILLS(J,K)
  190 CONTINUE
      WRITE(6,1340)K,KPRILLN,KRRILLN,KSRILLN
      KPSTILL=KPSTILL+KPRILLN
      KRSTILL=KRSTILL+KRRILLN
      KSSTILL=KSSTILL+KSRILLN
  200 CONTINUE
      WRITE(6,1075)KPSTILL,KRSTILL,KSSTILL
      RETURN
      END
```

FIGURE F.3

```
      SUBROUTINE TECHSER
      COMMON LIBRARY(100,5),NRUNQTI(100,5),NSUNQTI(100,5)
      COMMON IREGION(100,5),NSERVED(100,5),NVOLUMS(100,5)
      COMMON NTITLES(100,5),NVOLACQ(100,5),NTITACQ(100,5)
      COMMON NBOROWS(100,5)
      COMMON LIBTYPE(5),NLBTYPE(5)
      COMMON NRGIONS,NTYPSLB
      COMMON NTRSERV(15),NTRVOLS(15),NTRTITS(15),NTRVOLA(15)
      COMMON NTRTITA(15),NTRRUQT(15),NTRSUQT(15),NTRVLBR(15)
      COMMON NTSSERV,NTSVOLS,NTSTITS,NTSVOLA
      COMMON NTSTITA,NTSRUQT,NTSSUQT,NTSVLBR
      COMMON KPRILLS(5,15),KRRILLS(5,15),KSRILLS(5,15)
      COMMON KPRPRCS(5,15),KRRPRCS(5,15),KSRPRCS(5,15)
      COMMON KPRLCVL(5,15),KRRLCVL(5,15),KSRLCVL(5,15)
 1000 FORMAT(1H1,33HPRESENT SYSTEM TECHNICAL SERVICES,///)
 1010 FORMAT(1H ,A10,10H LIBRARIES,//)
 1015 FORMAT(1H ,20X,10H   VOLUMES,10X,10H    TITLES,10X,10H     TOTAL)
 1020 FORMAT(1H ,20X,10H  ACQUIRED,10H      COST,10H  ACQUIRED,
     X10H      COST,10H      COST,/)
 1030 FORMAT(1H ,10H    REGION,I3,/)
 1040 FORMAT(1H ,10X,A10,5I10)
 1050 FORMAT(1H0,7X,12HREGION TOTAL,1X,2I10,10X,2I10,/)
 1060 FORMAT(1H+,7X,12HNO LIBRARIES,/)
 1070 FORMAT(1H0,7X,11HSTATE TOTAL,2X,2I10,10X,2I10,//////)
 1075 FORMAT(1H0,7X,11HSTATE TOTAL,2X,3I10,//////)
 1100 FORMAT(1H1,35HREGIONAL NETWORK TECHNICAL SERVICES,///)
 1200 FORMAT(1H1,36HSTATEWIDE NETWORK TECHNICAL SERVICES,///)
 1300 FORMAT(1H1,34HTECHNICAL SERVICES FOR ALL SYSTEMS,///)
 1310 FORMAT(1H ,30X,10H  REGIONAL,10H STATEWIDE)
 1320 FORMAT(1H ,20X,10H   PRESENT,10H   NETWORK,10H   NETWORK)
 1330 FORMAT(1H ,20X,10H      COST,10H      COST,10H      COST,/)
 1340 FORMAT(1H ,10H    REGION,I3,7X,3I10)
 1350 FORMAT(1H ,13HALL LIBRARIES,//)
C
C     CALCULATE PRESENT SYSTEM TECHNICAL SERVICES
C
      WRITE(6,1000)
      DO 30 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSVOLAQ=0
      KSVOLPR=0
      KSTITPR=0
      KSPROCS=0
      DO 20 K=1,NRGIONS
      WRITE(6,1030)K
      NRVOLAQ=0
      KRVOLPR=0
      KRTITPR=0
      NPRINTS=0
      DO 10 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 10
      NRVOLAQ=NRVOLAQ+NVOLACQ(I,J)
      NSVOLAQ=NSVOLAQ+NVOLACQ(I,J)
```

FIGURE F.3

```
      KVOLPRC=NVOLACQ(I,J)*.60
      KRVOLPR=KRVOLPR+KVOLPRC
      KSVOLPR=KSVOLPR+KVOLPRC
      KTITPRC=NTITACQ(I,J)*5.00
      KRTITPR=KRTITPR+KTITPRC
      KSTITPR=KSTITPR+KTITPRC
      KPROCSS=KVOLPRC+KTITPRC
      KPRPRCS(J,K)=KPRPRCS(J,K)+KPROCSS
      KSPROCS=KSPROCS+KPROCSS
      WRITE(6,1040)LIBRARY(I,J),NVOLACQ(I,J),KVOLPRC,NTITACQ(I,J),
     XKTITPRC,KPROCSS
      NPRINTS=1
   10 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 15
      WRITE(6,1050)NRVOLAQ,KRVOLPR,KRTITPR,KPRPRCS(J,K)
      GO TO 20
   15 WRITE(6,1060)
   20 CONTINUE
      WRITE(6,1070)NSVOLAQ,KSVOLPR,KSTITPR,KSPROCS
   30 CONTINUE
C
C     CALCULATE REGIONAL NETWORK TECHNICAL SERVICES
C
      WRITE(6,1100)
      DO 120 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSVOLAQ=0
      KSVOLPR=0
      KSTITPR=0
      KSPROCS=0
      DO 110 K=1,NRGIONS
      WRITE(6,1030)K
      NRVOLAQ=0
      KRVOLPR=0
      KRTITPR=0
      NPRINTS=0
      DO 100 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 100
      NRVOLAQ=NRVOLAQ+NVOLACQ(I,J)
      NSVOLAQ=NSVOLAQ+NVOLACQ(I,J)
      KVOLPRC=NVOLACQ(I,J)*.60
      KRVOLPR=KRVOLPR+KVOLPRC
      KSVOLPR=KSVOLPR+KVOLPRC
      REGNUNQ=NTRRUQT(K)
      REGNTIT=NTRTITS(K)
      IF(REGNTIT.EQ.0) REGNTIT=.00001
      KTITPRC=NT9TACQ(I,J)*2.00+(NTITACQ(I,J)*(REGNUNQ/REGNTIT)*3.00)
      KRTITPR=KRTITPR+KTITPRC
      KSTITPR=KSTITPR+KTITPRC
      KPROCSS=KVOLPRC+KTITPRC
      KRRPRCS(J,K)=KRRPRCS(J,K)+KPROCSS
      KSPROCS=KSPROCS+KPROCSS
      WRITE(6,1040)LIBRARY(I,J),NVOLACQ(I,J),KVOLPRC,NTITACQ(I,J),
```

FIGURE F.3

```
    XKTITPRC,KPROCSS
     NPRINTS=1
 100 CONTINUE
     IF(NPRINTS.EQ.0) GO TO 105
     WRITE(6,1050)NRVOLAQ,KRVOLPR,KRTITPR,KSRPRCS(J,K)
     GO TO 110
 105 WRITE(6,1060)
 110 CONTINUE
     WRITE(6,1070)NSVOLAQ,KSVOLPR,KSTITPR,KSPROCS
 120 CONTINUE
C
C     CALCULATE STATEWIDE NETWORK TECHNICAL SERVICES
C
     WRITE(6,1200)
     DO 200 J=1,NTYPSLB
     WRITE(6,1010)LIBTYPE(J)
     WRITE(6,1015)
     WRITE(6,1020)
     NUMLIBS=NL2TYPE(J)
     NSVOLAQ=0
     KSVOLPR=0
     KSTITPR=0
     KSPROCS=0
     DO 190 K=1,NRGIONS
     WRITE(6,1030)K
     NRVOLAQ=0
     KRVOLPR=0
     KRTITPR=0
     NPRINTS=0
     DO 180 I=1,NUMLIBS
     IF(IREGION(I,J).NE.K) GO TO 180
     NRVOLAQ=NRVOLAQ+NVOLACQ(I,J)
     NSVOLAQ=NSVOLAQ+NVOLACQ(I,J)
     KVOLPRC=NVOLACQ(I,J)*.60
     KRVOLPR=KRVOLPR+KVOLPRC
     KSVOLPR=KSVOLPR+KVOLPRC
     STATUNQ=NTSSUOT
     STATTIT=NTSTITS
     KTITPRC=NTITACQ(I,J)*2.00+(NTITACQ(I,J)*(STATUNQ/STATTIT)*3.00)
     KRTITPR=KRTITPR+KTITPRC
     KSTITPR=KSTITPR+KTITPRC
     KPROCSS=KVOLPRC+KTITPRC
     KSRPRCS(J,K)=KSRPRCS(J,K)+KPROCSS
     KSPROCS=KSPROCS+KPROCSS
     WRITE(6,1040)LIBRARY(I,J),NVOLACQ(I,J),KVOLPRC,NTITACQ(I,J),
    XKTITPRC,KPROCSS
     NPRINTS=1
 180 CONTINUE
     IF(NPRINTS=EQ.0) GO TO 185
     WRITE(6,1050)NRVOLAQ,KRVOLPR,KRTITPR,KSRPRCS(J,K)
     GO TO 190
 185 WRITE(6,1060)
 190 CONTINUE
     WRITE(6,1070)NSVOLAQ,KSVOLPR,KSTITPR,KSPROCS
 200 CONTINUE
C
```

FIGURE F.3

```
C     SUMMARIZE TECHNICAL SERVICES FOR ALL SYSTEMS
C
      WRITE(6,1300)
      DO 220 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      KPSPRCS=0
      KRSPRCS=0
      KSSPRCS=0
      DO 210 K=1,NRGIONS
      WRITE(6,1340)K,KPRPRCS(J,K),KRRPRCS(J,K),KSRPRCS(J,K)
      KPSPRCS=KPSPRCS+KPRPRCS(J,K)
      KRSPRCS=KRSPRCS+KRRPRCS(J,K)
      KSSPRCS=KSSPRCS+KSRPRCS(J,K)
  210 CONTINUE
      WRITE(6,1075)KPSPRCS,KRSPRCS,KSSPRCS
  220 CONTINUE
      WRITE(6,1350)
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      DO 240 K=1,NRGIONS
      KPRPROC=0
      KRRPROC=0
      KSRPROC=0
      DO 230 J=1,NTYPSLB
      KPRPROC=KPRPROC+KPRPRCS(J,K)
      KRRPROC=KRRPROC+KRRPRCS(J,K)
      KSRPROC=KSRPROC+KSRPRCS(J,K)
  230 CONTINUE
      WRITE(6,1340)K,KPRPROC,KRRPROC,KSRPROC
      KPSTPRC=KPSTPRC+KPRPROC
      KRSTPRC=KRSTPRC+KRRPROC
      KSSTPRC=KSSTPRC+KSRPROC
  240 CONTINUE
      WRITE(6,1075)KPSTPRC,KRSTPRC,KSSTPRC
      RETURN
      END
```

FIGURE F.3

```
      SUBROUTINE COLMGMT
      COMMON LIBRARY(100,5),NRUNQTI(100,5),NSUNQTI(100,5)
      COMMON IREGION(100,5),NSERVED(100,5),NVOLUMS(100,5)
      COMMON NTITLES(100,5),NVOLACQ(100,5),NTITACQ(100,5)
      COMMON NBOROWS(100,5)
      COMMON LIBTYPE(5),NLBTYPE(5)
      COMMON NRGIONS,NTYPSLB
      COMMON NTRSERV(15),NTRVOLS(15),NTRTITS(15),NTRVOLA(15)
      COMMON NTRTITA(15),NTRRUQT(15),NTRSUQT(15),NTRVLBR(15)
      COMMON NTSSERV,NTSVOLS,NTSTITS,NTSVOLA
      COMMON NTSTITA,NTSRUQT,NTSSUQT,NTSVLBR
      COMMON KPRILLS(5,15),KRRILLS(5,15),KSRILLS(5,15)
      COMMON KPRPRCS(5,15),KRRPRCS(5,15),KSRPRCS(5,15)
      COMMON KPRLCVL(5,15),KRRLCVL(5,15),KSRLCVL(5,15)
 1000 FORMAT(1H1,36HPRESENT SYSTEM COLLECTION MANAGEMENT,///)
 1010 FORMAT(1H ,A10,10H LIBRARIES,//)
 1015 FORMAT(1H ,20X,10H LOW CIRC.)
 1020 FORMAT(1H ,20X,10H   VOLUMES,10H      COST,/)
 1030 FORMAT(1H ,10H    REGION,I3,/)
 1040 FORMAT(1H ,10X,A10,2I10)
 1050 FORMAT(1H0,7X,12HREGION TOTAL,1X,2I10,/)
 1060 FORMAT(1H+,7X,12HNO LIBRARIES,/)
 1070 FORMAT(1H0,7X,11HSTATE TOTAL,2X,2I10,//////)
 1075 FORMAT(1H0,7X,11HSTATE TOTAL,2X,3I10,//////)
 1100 FORMAT(1H1,38HREGIONAL NETWORK COLLECTION MANAGEMENT,///)
 1200 FORMAT(1H1,39HSTATEWIDE NETWORK COLLECTION MANAGEMENT,///)
 1300 FORMAT(1H1,37HCOLLECTION MANAGEMENT FOR ALL SYSTEMS,///)
 1310 FORMAT(1H ,30X,10H  REGIONAL,10H STATEWIDE)
 1320 FORMAT(1H ,20X,10H   PRESENT,10H   NETWORK,10H   NETWORK)
 1330 FORMAT(1H ,20X,10H      COST,10H      COST,10H      COST,/)
 1340 FORMAT(1H ,10H    REGION,I3,7X,3I10)
 1350 FORMAT(1H ,13HALL LIBRARIES,//)
C
C     CALCULATE PRESENT SYSTEM COLLECTION MANAGEMENT
C
      WRITE(6,1000)
      DO 30 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSLCVOL=0
      KSLCVOL=0
      DO 20 K=1,NRGIONS
      WRITE(6,1030)K
      NRLCVOL=0
      NPRINTS=0
      DO 10 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 10
      NLCVOLM=NTITLES(I,J)*.50
      NRLCVOL=NRLCVOL+NLCVOLM
      NSLCVOL=NSLCVOL+NLCVOLM
      KLCVOLM=NLCVOLM*.20
      KPRLCVL(J,K)=KPRLCVL(J,K)+KLCVOLM
      KSLCVOL=KSLCVOL+KLCVOLM
      WRITE(6,1040)LIBRARY(I,J),NLCVOLM,KLCVOLM
```

FIGURE F.3

```
      NPRINTS=1
   10 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 15
      WRITE(6,1050)NRLCVOL,KPRLCVL(J,K)
      GO TO 20
   15 WRITE(6,1060)
   20 CONTINUE
      WRITE(6,1070)NSLCVOL,KSLCVOL
   30 CONTINUE
C
C     CALCULATE REGIONAL NETWORK COLLECTION MANAGEMENT
C
      WRITE(6,1100)
      DO 120 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSLCVOL=0
      KSLCVOL=0
      DO 110 K=1,NRGIONS
      WRITE(6,1030)K
      NRLCVOL=0
      NPRINTS=0
      DO 100 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 100
      NLCVOLM=NRUNQTI(I,J)*.50
      NRLCVOL=NRLCVOL+NLCVOLM
      NSLCVOL=NSLCVOL+NLCVOLM
      KLCVOLM=NLCVOLM*.20
      KRRLCVL(J,K)=KRRLCVL(J,K)+KLCVOLM
      KSLCVOL=KSLCVOL+KLCVOLM
      WRITE(6,1040)LIBRARY(I,J),NLCVOLM,KLCVOLM
      NPRINTS=1
  100 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 105
      WRITE(6,1050)NRLCVOL,KRRLCVL(J,K)
      GO TO 110
  105 WRITE(6,1060)
  110 CONTINUE
      WRITE(6,1070)NSLCVOL,KSLCVOL
  120 CONTINUE
C
C     CALCULATE STATEWIDE NETWORK COLLECTION MANAGEMENT
C
      WRITE(6,1200)
      DO 200 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1015)
      WRITE(6,1020)
      NUMLIBS=NLBTYPE(J)
      NSLCVOL=0
      KSLCVOL=0
      DO 190 K=1,NRGIONS
      WRITE(6,1030)K
      NRLCVOL=0
```

FIGURE F.3

```
      NPRINTS=0
      DO 180 I=1,NUMLIBS
      IF(IREGION(I,J).NE.K) GO TO 180
      NLCVOLM=NSUNOTI(I,J)*.50
      NRLCVOL=NRLCVOL+NLCVOLM
      NSLCVOL=NSLCVOL+NLCVOLM
      KLCVOLM=NLCVOLM*.20
      KSRLCVL(J,K)=KSRLCVL(J,K)+KLCVOLM
      KSLCVOL=KSLCVOL+KLCVOLM
      WRITE(6,1040)LIBRARY(I,J),NLCVOLM,KLCVOLM
      NPRINTS=1
  180 CONTINUE
      IF(NPRINTS.EQ.0) GO TO 185
      WRITE(6,1050)NRLCVOL,KSRLCVL(J,K)
      GO TO 190
  185 WRITE(6,1060)
  190 CONTINUE
      WRITE(6,1070)NSLCVOL,KSLCVOL
  200 CONTINUE
C
C     SUMMARIZE COLLECTION MANAGEMENT FOR ALL SYSTEMS
C
      WRITE(6,1300)
      DO 220 J=1,NTYPSLB
      WRITE(6,1010)LIBTYPE(J)
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      KPSLCVL=0
      KRSLCVL=0
      KSSLCVL=0
      DO 210 K=1,NRGIONS
      WRITE(6,1340)K,KPRLCVL(J,K),KRRLCVL(J,K),KSRLCVL(J,K)
      KPSLCVL=KPSLCVL+KPRLCVL(J,K)
      KRSLCVL=KRSLCVL+KRRLCVL(J,K)
      KSSLCVL=KSSLCVL+KSRLCVL(J,K)
  210 CONTINUE
      WRITE(6,1075)KPSLCVL,KRSLCVL,KSSLCVL
  220 CONTINUE
      WRITE(6,1350)
      WRITE(6,1310)
      WRITE(6,1320)
      WRITE(6,1330)
      DO 240 K=1,NRGIONS
      KPRLWCV=0
      KRRLWCV=0
      KSRLWCV=0
      DO 230 J=1,NTYPSLB
      KPRLWCV=KPRLWCV+KPRLCVL(J,K)
      KRRLWCV=KRRLWCV+KRRLCVL(J,K)
      KSRLWCV=KSRLWCV+KSRLCVL(J,K)
  230 CONTINUE
      WRITE(6,1340)K,KPRLWCV,KRRLWCV,KSRLWCV
      KPSTLCV=KPSTLCV+KPRLWCV
      KRSTLCV=KRSTLCV+KRRLWCV
      KSSTLCV=KSSTLCV+KSRLWCV
```

FIGURE F.3

```
240 CONTINUE
    WRITE(6,1075)KPSTLCV,KRSTLCV,KSSTLCV
    RETURN
    END
```

APPENDIX G

MODELING, ESTIMATION, AND PREDICTION USES OF REGRESSION ANALYSIS IN LIBRARY RESEARCH

The use of quantitative techniques for network planning is not new, but particular methods widely utilized in other disciplines are virtually unknown to the library profession. This Appendix illustrates the method of multiple regression analysis as applied to modeling, estimation, and prediction of systems important in library planning.

Regression analysis requires three inputs:

1. A model or a set of alternative models.
2. Data corresponding to the variables included in the model(s).
3. Computational facilities to carry out the estimation of the parameter in the model(s).

Since library researchers have no body of generally accepted theory upon which to rely, the models utilized must of necessity be fairly ad hoc. This should not disqualify their usefulness, for the main purpose of regression analysis here is to establish stable empirical relationships among variables that can be observed and/or manipulated.

Data availability often presents a problem because many libraries do not collect the necessary data or do not collect data which are comparable with those collected by other libraries. Regression results are only as valid as the data used in estimation. However, the aim is to establish *average* relationships for all libraries. Therefore, one-hundred percent accuracy in the model's parameter estimates need not be the goal of the investigator.

Once the model(s) has been specified and the data collected, the process of multiple regression estimations is attempted. In most cases a ready-made computer program can easily handle the estimation procedure. Although this phase of research can be done on a desk calculator, it is recommended that the researcher obtain use of a high-speed computer. Hand computation is extremely time consuming and the possibility for error is great.

In what follows, selected results from working papers are presented in order to illustrate the possibilities for quantitative analysis using multiple regression.

Readers wishing to pursue the technical aspects of regression are referred to J. Johnston, *Econometric Methods*, McGraw-Hill, New York, 1963 and P. Rao and R. L. Miller, *Applied Econometrics*, Wadsworth Publishing Company, Belmont (March, 1971).

G.1 Determinants of Multiple-Copy Ordering

For proper evaluation of possible benefits and costs arising from network book processing, it may be necessary to estimate the degree of multiple-copy ordering in the library system. One obvious, but costly, procedure would involve extensive sampling of all the libraries to be involved in the network.

Another approach is to gather data from a sample of libraries and analyze this using the multiple regression technique. The data gathered for use in this project consisted of information on the degree of individual library duplicate ordering and other pertinent characteristics. It should be noted that these data are cross-section for the year 1968.

G.1.1 Theory

It is perhaps futile to embark upon a theory of multiple-book ordering. All that can sensibly be offered is some common-sense ad hockery.

The main determinants of duplicate ordering would seem to be the relative size of the library and concomitantly the size of the population served. Presumably, large libraries require more than one copy of certain books, especially best sellers, in order to keep the queuing time below what they consider an acceptable upper limit.

A priori, then, the following assumptions are made:

Assumption 1: $\frac{\partial(VA/TAD)}{\partial \; VOLUMS} > 0$

Assumption 2: $\frac{\partial(VA/TAD)}{\partial \; POP} > 0$

where VA = Volumes added
TAD = Titles added
POP = Population served
VOLUMS = Total book stock as measured by number of volumes in library.

Assumption 1 is that the degree of multiple-copy ordering will increase as the size of the library increases, holding all other things constant. Assumption 2 is that the degree of multiple-copy ordering will increase as the population served increases, holding other things constant.

Population served may not, though, give a true picture of patronage utilization. A large population could demand very little from the local library whereas the converse could be true for a library serving a relatively small population. Utilization can be measured quite well by circulation per capita (CIRCPC).

A priori, then:

Assumption 3: $$\frac{\partial (VA/TAD)}{\partial \, CIRCPC} > 0$$

Assumption 3 is that the degree of multiple-copy ordering increases as circulation per capita increases, cet. par.

G.1.2 Empirical Results--Simple Correlations

In an attempt to assess the validity of the above assumptions, the approach is to examine the zero-order sample correlations. The critical value of r is 0.3783 at the 90 percent level of confidence and 0.5614 at the 99 percent level. (These are obtained from Fisher's Z transformation.)

While recognizing the weaknesses in using simple correlations, because they do not take into account complex relationships among the variables, the data can be considered to have not contradicted assumptions 1 and 2, for:

$$r(VA/TAD, VOLUMS) = 0.63741$$
$$r(VA/TAD, POP) = 0.76227$$

Both these simple correlations are significant at the 1% level.

Assumption 3 contradicts the data in our sample, for:

$$r(VA/TAD, CIRCPC) = -0.0058$$

Although r is negative, it is almost zero, indicating no association rather than inverse association.

Some empirical associations that were not suggested in the theory but exist in the data may be given here:

$$r(VA/TAD, VOLADD) = 0.89154$$
$$r(VA/TAD, PCNTVA) = 0.64458$$

The first one indicates that there is an association in the data between the absolute magnitude of increases in book stock and the degree of multiple-copy ordering. This positive relationship holds also for variations in additions as a percent of existing book stock (PCNTVA).

G.1.3 Empirical Results--Multiple Regression Analysis

A more fruitful approach to the study of the determinants of multiple-copy ordering involves the estimation of more complex relationships. Thus regression analysis is appropriate. The functional form of the relation is first considered.

THE MODEL

One possible function form, multiplicative will be considered. In consideration of the theory from G.1.1 above, the following possible model can be posited.

$$VA/TAD = A(VOLUMS)^{\alpha}(CIRCPC)^{\beta}\, e^{\varepsilon}$$

where A, α, and β, are parameters to be estimated and e is a log normally distributed disturbance term. Using least squares estimation we obtain:

$$\log VA/TAD = \underset{(-4.6)}{-0.6115} + \underset{(6.18)}{0.5701} \log VOLUMS + \underset{(2.41)}{0.3668} \log CIRCPC$$

$$R^2 = 0.6954 \qquad F = 19.402$$

The results of the model indicate that if the size of the library is increased by 1%, a ½% increase in multiple-copy ordering results, and a 1% change in circulation per capita will cause a 1/3% change in multiple-copy ordering.

G.2 Determinants of Library Utilization

The degree of library utilization, that is, the demand for library services, is a crucial variable in making decisions as to the benefits received from particular expenditures on libraries. Moreover, one might wish to predict the future changes in library utilization. To this end a model is needed and estimates of relevant parameters must be made.

G.2.1. Theory

The demand for library services should, of course, be a function of the price paid. Since libraries do not operate via the usual market mechanism, there is no readily available price index to be used in estimation. A proxy for price, which is the reciprocal of availability as measured by total book stock is used here.

For this section, circulation per capita (CIRPC) is considered as one measure of library utilization (demand). Besides price, it could be expected that quality of service is positively related to CIRCPC. There are three possible measures of "quality" of service:

1. Operating expenditures per capita (OEXPPC): this figure represents the outlay for staff salaries, purchase of new books, rebinding, etc. (Direct expenses.)
2. Materials expenditure per capita (MEXPPC): This figure represents outlays for buildings and equipment. (Indirect expenses.)
3. Materials expenditure as a percent of operating expenditure (MAT/OP): this figure represents the proportion of money

spent on indirect as opposed to direct library services.

Another aspect of "quality" concerns the "newness" of the available collection. Presumably demand will increase as more new materials are added to the library. Thus volumes added (VOLADD) or perhaps volumes added as a percent of total volumes (PCNTVA) should be positively related to CIRCPC.

Lastly, the tastes of the community must be taken into account. One hypothesis might be that urban residents have tastes which include more reading than rural residents. Thus more populated areas should demand, cet. par., more library services. Total population (POP) will be the proxy for the urban-rural taste variable.

To summarize the above discussion symbolically:

(1) $$\frac{\partial \text{CIRCPC}}{\partial \text{PRICE}} < 0$$

(2) $$\frac{\partial \text{CIRCPC}}{\partial \text{OEXPPC}} > 0$$

(3) $$\frac{\partial \text{CIRCPC}}{\partial \text{MEXPPC}} > 0$$

(4) $$\frac{\partial \text{CIRCPC}}{\partial (\text{MEX/OP})} \overset{\leq}{>}$$

(5) $$\frac{\partial \text{CIRCPC}}{\partial \text{VOLADD}} > 0$$

(6) $$\frac{\partial \text{CIRCPC}}{\partial \text{PCNTVA}} > 0$$

(7) $$\frac{\partial \text{CIRCPC}}{\partial \text{POP}} > 0$$

G.2.2 The Model

For the purpose of estimation and prediction two functional forms are posited, a linear model and a multiplicative model (which is linear in its logarithms).

Model I:

$$\text{CIRCPC} = \beta_0 + \beta_1\text{POP} + \beta_2\text{PRICE} + \beta_3\text{OEXPPC}$$
$$+ \beta_4\text{MEXPPC} + \beta_5\text{VOLADD} + \varepsilon_I$$

Model II:

$$\text{CIRCPC} = \beta_0'(\text{POP})^{\beta_1'}(\text{PRICE})^{\beta_2'}(\text{OEXPPC})^{\beta_3'}(\text{MEXPPC})^{\beta_4'}(\text{VOLADD})^{\beta_5'}e^{\varepsilon_{II}}$$

The β's and β''s are the parameters to be estimated and ε_I is assumed randomly distributed as $N(0, \sigma^2)$ and ln ε_{II} is assumed randomly distributed as $N(0,\sigma^2)$.

G.2.3 Empirical Results: Multiple Regression

Stepwise regression was used to fit the model. Ordinary least squares estimation was utilized despite some obvious simultaneity problems.

Model Ia:

$$\text{CIRCPC} = \underset{(2.592)}{3.405} - \underset{(-1.667)}{0.0000106}\ \text{POP} - \underset{(-0.344)}{24032.0}\ \text{PRICE} + \underset{(2.397)}{0.827}\ \text{OEXPPC} + \underset{(0.328)}{0.863}\ \text{MEXPPC} + \underset{(1.4214)}{0.00005}\ \text{VOLADD}$$

$$\bar{R}^2 = .4813 \qquad \text{d.f.} = 14$$

Model IIa:

$$\ln \text{CIRCPC} = \underset{(2.406)}{2.002} - \underset{(3.1917)}{0.662} \ln \text{POP} - \underset{(-2.708)}{0.6247} \ln \text{PRICE} + \underset{(1.945)}{0.425} \ln \text{OEXPPC} - \underset{(-1.215)}{0.2908} \ln \text{MEXPPC} + \underset{(1.406)}{0.312} \ln \text{VOLADD}$$

$$\bar{R}^2 = 0.6714 \qquad \text{d.f.} = 14$$

Some interesting results can be seen above. First, the coefficient of POP and of ln POP is negative and even significantly negative. This indicates that the hypothesis about a rural population being less interested in reading might be unsubstatiated by the data.

In model Ia the other coefficients were of the anticipated signs but those of MEXPPC and VOLADD were not significant. Model IIa yielded similar results with an insignificant coefficient of ln MEXPPC. Note that although the $\bar{R}^2$ (goodness of fit corrected for degrees of freedom) is higher in Model IIa, these measures are noncomparable because the dependent variables are not the same in Models Ia and IIa.

Since the theory is not unambiguous, the data indicates that MEXPPC is a superfluous variable.

Re-estimating the equations without MEXPPC and ln MEXPPC yields:
Model Ib:

$$\text{CIRCPC} = \underset{(3.811)}{4.249} - \underset{(-1.988)}{0.0000197}\ \text{POP} - \underset{(-1.1638)}{26741.0}\ \text{PRICE} + \underset{(2.4520)}{0.6877}\ \text{OEXPPC} + \underset{(1.842)}{0.000064}\ \text{VOLADD}$$

$$\bar{R}^2 = 0.5503 \qquad \text{d.f.} = 15$$

Model IIb:

$$\begin{aligned} \ln \text{CIRCPC} = {} & \underset{(2.298)}{1.938} - \underset{(-2.963)}{0.6199} \ln \text{POP} = \underset{(-1.783)}{0.5761} \ln \text{PRICE} \\ & + \underset{(1.497)}{0.2524} \ln \text{OEXPPC} + 0.238 \ln \text{VOLADD} \end{aligned}$$

$$\overline{R}^2 = 0.6610 \qquad \text{d.f.} = 15$$

Since the remaining coefficient estimates did not change much, and the $\overline{R}^2$'s remained about the same, MEXPPC and ln MEXPPC are superfluous.

In an attempt to obtain the best predictor of CIRCPC and ln CIRCPC, VOLADD and ln VOLADD are eliminated with the following results:

Model Ic:

$$\begin{aligned} \text{CIRCPC} = {} & \underset{(4.101)}{3.357} - \underset{(-1.864)}{0.00001} \text{ POP} - \underset{(-1.041)}{2.7041} \text{ PRICE} \\ & + \underset{(4.412)}{0.9116} \text{ OEXPPC} \end{aligned}$$

$$\overline{R}^2 = 0.5761 \qquad \text{d.f.} = 16$$

Model IIc:

$$\begin{aligned} \ln \text{CIRCPC} = {} & \underset{(2.197)}{1.250} - \underset{(-2.927)}{0.4658} \ln \text{POP} - \underset{(-2.566)}{0.4586} \ln \text{PRICE} \\ & + \underset{(1.591)}{0.2690} \ln \text{OEXPPC} \end{aligned}$$

$$\overline{R}^2 = 0.6565 \qquad \text{d.f.} = 16$$

From the multiple regression results it can be concluded that more populated areas do not utilize (on a per capita basis) libraries more than less populated areas.

Also, availability does determine to some extent the degree of utilization as does the expenditures on direct services.

G.3 Determinants of Total Library Circulation

In the previous example the determinants of library utilization as measured by circulation per capita were examined. It was found that the most efficient prediction model included population, price, and operating expenditures per capita. In this example the determinants of total circulation are examined.

G.3.1 Theory

As before, this hypothesis is that demand is a function of price, quality of services, and tastes. Price is measured by the reciprocal of total book stock. Total book stock is a proxy for availability. The quality of service is measured by direct expenses (operating) and the ratio of indirect (materials) to direct expenditures. Also the number of volumes added may be an indicator of quality.

Again population will be used as a proxy for taste. For determining circulation per capita, the coefficient of population was negative, indicating higher utilization rates in rural areas. For total circulation this negative relationship should not exist because, as is obvious, more populated areas have larger libraries and also larger circulation.

G.3.2 The Model

For simplicity, results from only a log linear demand function will be presented:

$$(1) \quad \log \text{TCIRC} = \beta_o + \beta_i \log \text{PRICE} + \sum_{L=2}^{k} \beta_i \log \text{QUALITY} + \beta_{k+1} \log \text{TASTE} + \varepsilon$$

is assumed log-normally distributed with mean zero and constant variance. In the empirical section below, the results of different measures of quality are presented.

G.3.3 Empirical Results: Multiple Regression

Model I:

$$\begin{aligned} \log \text{TCIRC} = \underset{(2.479)}{2.024} - \underset{(-4.329)}{0.718} \log \text{PRICE} + \underset{(1.618)}{0.335} \log \text{PCNTVA} \\ \underset{(-1.848)}{-0.375} \log \text{MAT/OP} + \underset{(1.550)}{0.247} \log \text{POP} \end{aligned}$$

$R^2 = .973 \qquad \bar{R}^2 = .966 \qquad \text{d.f.} = 15$

As hypothesized, the coefficient of log PRICE was negative and it was significant. The negative coefficient of log MAT/OP indicates that cet. par., when more of a fixed budget is spent on direct services, there is higher circulation. The direction of causation may of course be argued to be the other way.)

The fit of the equation to the data was very good as evidenced by an $\bar{R}^2$ in excess of .9. It will be hard to improve the predictive powers of Model I. But it may be interesting to see the effects of other measures of quality and also to see if fewer variables will yield a usable prediction model.

Leaving out log POP:

Model II

$$\log TCIRC = \underset{(3.453)}{2.609} - \underset{(-18.293)}{0.962} \log PRICE + \underset{(3.580)}{0.534} \log PCNTVA - \underset{(-1.541)}{0.321} \log MAT/OP$$

$R^2 = 0.969 \qquad \bar{R}^2 = 0.963 \qquad d.f. = 16$

Notice that the coefficient of price is now almost unity. That is, the demand for TCIRC has unitary price elasticity. The $\bar{R}^2$ did not change much when log POP was dropped from the regression.

G.4 Book Processing--Prediction of Volumes and Titles Added

In order to predict the cost savings due to network-wide central book processing schemes, it might be necessary to predict future levels of book ordering. To this end, several prediction models are examined here.

G.4.1 Theory

It can be reasonably assumed that book ordering (volumes added = VOLADD) is a function of the size of the library, as measured by total number of volumes (VOLUMS) and the size of the patronage (POP). Hence, in straight linear form:

(1) $VOLADD = \beta_0 + \beta_1 VOLUMS + \beta_2 POP + \varepsilon_1$

and in multiplicative form

(2) $VOLADD = \beta_0 (VOLUMS)^{\beta_1} (POP)^{\beta_2} e^{\varepsilon_2}$

Total circulation or circulation per capita is expected to influence book additions also. It could be posited, for example:

(3) $VOLADD = \gamma_0 + \gamma_1 POP + \gamma_2 CIRC + \varepsilon_3$

or

(4) $VOLADD = \gamma_0 (POP)^{\gamma_1} (CIRC)^{\gamma_2} e^{\varepsilon_4}$

If a library finds itself requesting more interlibrary loans (ILL) we can hypothesize that it will order more books in an attempt to satisfy patrons with shorter average response times:

(5) $VOLADD = \delta_0 + \delta_1 VOL + \delta_2 ILL + \varepsilon_5$

and also multiplicatively

(6) $VOLADD = \delta_0 VOL^{\delta_1} ILL^{\delta_2} e^{\varepsilon_5}$

G.4.2 Regression Results

Using data from 88 libraries in 1967, the following parameter estimates and statistical fits were obtained:

$$(1.1)\quad VOLADD = \underset{(0.996)}{325.48} - \underset{(-0.649)}{0.0042}\ VOL + \underset{(10.858)}{.1389}\ POP$$

$$R^2 = .940 \qquad \bar{R}^2 = .938 \qquad d.f. = 85$$

$$(2.1)\quad \ln VOLADD = \underset{(-6.083)}{-3.286} + \underset{(5.756)}{0.8174}\ \ln VOL + \underset{(2.253)}{0.253}\ \ln POP$$

$$R^2 = .908 \qquad \bar{R}^2 = .906 \qquad d.f. = 85$$

$$(3.1)\quad VOLADD = \underset{(-0.5003)}{-346.836} + \underset{(36.679)}{0.13117}\ POP + \underset{(1.0696)}{90.451}\ CIRC$$

$$R^2 = 0.9406 \qquad \bar{R}^2 = 0.939 \qquad d.f. = 85$$

$$(4.1)\quad \ln VOLADD = \underset{(-5.805)}{-1.42066} + \underset{(2.350)}{0.184}\ \ln POP + \underset{(9.334)}{0.648}\ \ln CIRC$$

$$R^2 = 0.9370 \qquad \bar{R}^2 = 0.93551 \qquad d.f. = 85$$

$$(5.1)\quad VOLADD = \underset{(-0.034)}{-18.196} + \underset{(10.853)}{0.0612}\ VOL + \underset{(2.118)}{3.040}\ ILL$$

$$R^2 = 0.8642 \qquad \bar{R}^2 = 0.8611 \qquad d.f. = 85$$

$$(6.1)\quad \ln VOLADD = \underset{(-9.3298)}{-4.057} + \underset{(22.543)}{1.113}\ \ln VOL + \underset{(0.404)}{0.0128}\ \ln ILL$$

$$R^2 = 0.9029 \qquad \bar{R}^2 = 0.9006 \qquad d.f. = 85$$

G.4.3 Titles Added

One possible method of obtaining predictions of volumes added and titles added is to combine one of the prediction equations above with the regression results for multiple-copy ordering. (G.1.3 above.) Another approach is to use duplication factors and predict titles added directly. Using the same data as before, but deflating VOLADD by a duplication factor, the following prediction equations for titles added (TITLADD) were obtained:

$$\text{TITLADD} = \underset{(5.722)}{1256.92} + \underset{(1.181)}{0.0052}\ \text{VOL} + \underset{(2.159)}{0.0186}\ \text{POP} \tag{1.2}$$

$$R^2 = 0.6214 \qquad \bar{R}^2 = 0.6125$$

$$\ln\ \text{TITLADD} = \underset{(-2.015)}{-1.301} + \underset{(3.726)}{0.6328}\ \ln \text{VOL} + \underset{(1.594)}{0.214}\ \ln \text{POP} \tag{2.2}$$

$$R^2 = 0.8135 \qquad \bar{R}^2 = 0.8092$$

$$\text{TITLADD} = \underset{(5.76)}{1273.4} + \underset{(1.758)}{0.024}\ \text{POP} + \underset{(0.3115)}{0.00066}\ \text{CIRC} \tag{3.2}$$

$$R^2 = 0.61566 \qquad \bar{R}^2 = 0.6066$$

$$\ln\ \text{TITLADD} = \underset{(-0.397)}{-0.107} - \underset{(-0.616)}{0.053}\ \ln \text{POP} + \underset{(9.1601)}{0.703}\ \ln \text{CIRC} \tag{4.2}$$

$$R^2 = 0.8908 \qquad \bar{R}^2 = 0.8883$$

$$\text{TITLADD} = \underset{(237.810)}{1170.32} + \underset{(9.545)}{0.0132}\ \text{VOL} + \underset{(1.794)}{1.1591}\ \text{ILL} \tag{5.2}$$

$$R^2 = 0.615 \qquad \bar{R}^2 = 0.6062$$

$$\ln\ \text{TITLADD} = \underset{(-3.802)}{-1.950} + \underset{(15.150}{0.883}\ \ln \text{VOL} + \underset{(0.3129)}{0.017}\ \ln \text{ILL} \tag{6.2}$$

$$R^2 = 0.808 \qquad \bar{R}^2 = 0.804$$

G.5 Demand for Interlibrary Loans (1969 Data)

To assess the effectiveness of possible network configurations it will be necessary to use some interlibrary loan (ILL) figures. Several different approaches are possible. One would be to use the latest data available from the Library News Bulletin. Another is to use multiple regression to formulate a fixed prediction equation. This section presents the results of regression analysis for this purpose.

G.5.1 Regression Results

Using the model which relates interlibrary loan demand to population and size of library, multiple regression results are:

$$\text{ILL} = \underset{(2.1915)}{120.642} - \underset{(-6.732)}{0.00602}\ \text{VOL} + \underset{(9.507)}{0.01696}\ \text{POP} \tag{1}$$

$$R^2 = 0.7158 \qquad \bar{R}^2 = 0.70719 \qquad \text{d.f.} = 66$$

G.6 Determination of Collection Size by Subject Classification.

It is a widely observed phenomenon that small libraries usually hold a different type of collection than large libraries. The question to be asked is whether there exists a stable relationship between library size and the subject makeup of the collection. This section makes an initial attempt at answering this question.

G.6.1 Model and Data Used

A very simple linear model is postulated:

(1) $\text{SUB}_i\ \% = \beta_o + \beta_1\ \text{VOL} + \beta_2\ D + \varepsilon$

where:

SUB % = the percentage of the library's book stock that consists of subject i.
VOL = total volumes in library
D = a dummy variable that takes on the values:
1 if a 4 year college
0 otherwise

The data are taken from this project's June, 1970 Interim Report and the subjects are the major groups of the Dewey Decimal System, i.e. 100's, 200's, etc.

G.6.2 Regression Results

$$(1)\quad \text{000's} = \underset{(5.488)}{0.9234} + \underset{(2.845)}{0.0000011}\ \text{VOL} + \underset{(1.651)}{0.631}\ D$$

$$R^2 = 0.396 \qquad \text{d.f.} = 15$$

$$(2)\quad \text{100's} = \underset{(10.323)}{1.851} + \underset{(1.803)}{0.0000007}\ \text{VOL} + \underset{(9.715)}{3.9591}\ D$$

$$R^2 = 0.863 \qquad \text{d.f.} = 15$$

$$(3)\quad \text{200's} = \underset{(14.348)}{2.513} + \underset{(0.649)}{0.0000003}\ \text{VOL} - \underset{(-0.357)}{0.142}\ D$$

$$R^2 = 0.039 \qquad \text{d.f.} = 15$$

$$(4)\quad \text{300's} = \underset{(12.119)}{9.582} + \underset{(2.433)}{0.0000043}\ \text{VOL} + \underset{(10.3099)}{18.529}\ D$$

$$R^2 = 0.878 \qquad \text{d.f.} = 15$$

$$(5)\quad \text{400's} = \underset{(9.148)}{0.7359} + \underset{(1.776)}{0.0000003}\ \text{VOL} + \underset{(1.880)}{0.344}\ D$$

$$R^2 = 0.285 \qquad \text{d.f.} = 15$$

$$(6)\quad \text{500's} = \underset{(17.155)}{4.036} + \underset{(4.3098)}{0.0000023}\ \text{VOL} + \underset{(7.539)}{4.0317}\ D$$

$$R^2 = 0.8206 \qquad \text{d.f.} = 15$$

$$(7)\quad 600's = \underset{(26.266)}{9.981} + \underset{(2.747)}{0.0000024}\ VOL - \underset{(-2.136)}{1.845}\ D$$

$$R^2 = -.4775 \qquad d.f. = 15$$

$$(8)\quad 700's = \underset{(19.268)}{9.057} + \underset{(3.922)}{0.0000042}\ VOL - \underset{(-1.648)}{1.762}\ D$$

$$R^2 = 0.5706 \qquad d.f. = 15$$

$$(9)\quad 800's = \underset{(9.921)}{8.499} - \underset{(0.245)}{0.000005}\ VOL + \underset{(3.626)}{7.062}\ D$$

$$R^2 = 0.476 \qquad d.f. = 15$$

$$(10)\quad 900's = \underset{(38.8)}{14.505} - \underset{(-1.035)}{0.0000009}\ VOL + \underset{(1.4120)}{1.199}\ D$$

$$R^2 = 0.1876 \qquad d.f. = 15$$

The R^2's of these equations vary widely and this indicates that more research needs to be done on which items to include as other independent variables to produce equations with better fit.